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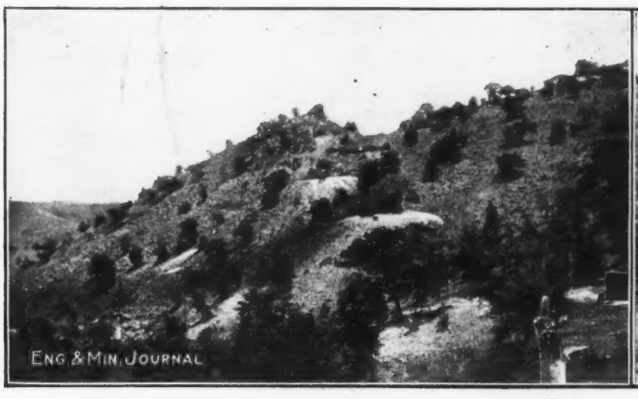
The Oro Blanco District of Arizona

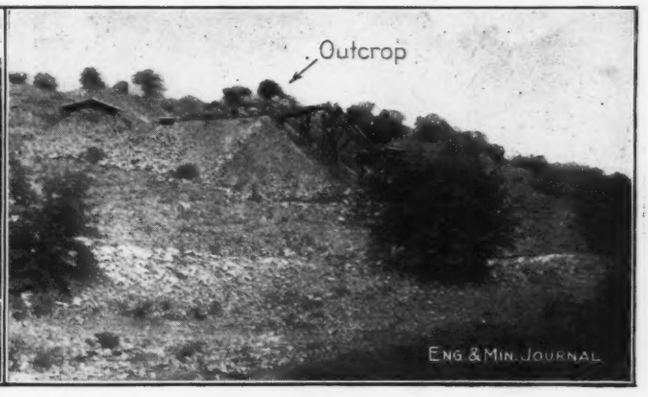
By Maxwell C. Milton*

SYNOPSIS—A neglected district originally worked by Spaniards and Indians. Overpromoted by Americans, it lost caste and is only now beginning to be seriously explored. Gold, silver and copper are of importance in the order named.

The Oro Blanco mining district is in the western part of Santa Cruz County, Ariz., approximately 70 miles south-southwest from Tucson. The nearest railroad point is Amado, a station on the Nogales branch of the Southern Pacific R.R., about 35 miles from the town of Oro Blanco.



Australitz Hill



Old Glory Mine

In the Oro Blanco District, Arizona

The district was worked to some extent by the Spaniards and Indians before the occupation of Arizona by the Americans, but the placers and rich outcrops early attracted prospectors. During the late '80s and early '90s the district was active, but most of the money was spent on reduction works rather than on underground development. As is usual, this kind of mining met with financial disaster in nearly every case. Until 1912, I believe there was only one shaft in the district over 300 ft. deep, but a ride of a few hours on a horse would take one to the wrecks of eight or nine mills ranging in size from five to 40 stamps. Since 1911 there has been a renewed activity in the camp along more conservative lines, and while these efforts have not been rewarded by large success, the district is still in a fair way to develop some profitable mines.

Rhyolite and Porphyrite Most Important Rocks

The only sedimentary rock outcropping in the mineralized area is a conglomerate made up of fragments of crystalline igneous rocks. A large portion of these fragments is angular, and in places the rock has the appearance of a volcanic breccia. The age of this rock has not been determined. The most widely distributed rock on the surface is rhyolite, which in many places has a decidedly porphyritic texture. Isolated areas of the rhyolite, sometimes comprising 20 or more acres, have been intensely silicified, and such areas always carry appreciable quantities of gold.

In point of quantity the only other important rock is a quartz-monzonite porphyrite or a quartz-diorite porphyrite, occurring as an intrusion several miles in both length and width. In hand specimens this rock, bluish-gray in color, has a distinct porphyritic texture. Phenocrysts of white feldspar are abundant and well developed, crystals ¼ in. long being frequently seen. Small crystals of a ferromagnesian mineral are present in considerable quantities, being characteristically lath-shaped. Quartz is sparsely developed as rounded phenocrysts but is always present. Thin sections, under the microscope, show the feldspar to be plagioclase. The plagioclase has suffered much decomposition, being altered to kaolin, sericite, and in some places almost completely to calcite. The sericitization would indicate that some of the alteration at least was due to deep-seated action rather than weathering. The ferromagnesian mineral is hornblende which has been altered to chlorite. The quartz phenocrysts show some resorption by the groundmass, which is composed of an intimate mixture of quartz and orthoclase.

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Gold and Silver the Principal Minerals

Mineralization has been spread over a large area and has a great range in species. Gold and silver have attracted the most attention and are probably the most widely distributed. Native gold occurs in the placers and in the oxidized outcrops of all the veins. It also occurs free in some of the veins below water level, and, as mentioned, in the silicified rhyolite. Occasional small pieces of native silver have been found. Tellurides have been reported, but I have never seen any. The metallic gold has silver in combination and is about 600 fine. Gold also occurs associated with pyrite and chalcopyrite; in which deposits the copper is a valuable constituent.

East Outcrop of Montana Mine

Silver occurs associated with lead and zinc. In one deposit consisting of an intimate mixture of lead and zinc sulphides, silver is present in the ratio of one ounce to the per cent. of zinc; 50% of the silver is in the zinc. In other lead-zinc deposits the silver goes with the lead. Antimony and arsenic have been reported from one deposit. In general the oxidized zone has but a small vertical extent and sulphide minerals come in at a few feet below the outcrops. Further, the transition from oxidized minerals to primary minerals is sharp; there is no appreciable zone of secondary enrichment deposits.

There are several types of deposits. In the southern part of the district the veins are fractures filled with fragments of the wall rock held together by a soft gouge, in which there is considerable manganese. In these veins the principal value is in free gold, and the absence of silicification is notable. It is possible that development will show a zone of secondary enrichment in these deposits. In the northern part of the district the veins are replacements of country rock by quartz. The mineralization is of two kinds, lead-zinc carrying silver and subordinate amounts of copper, and pyrite-chalcopyrite carrying gold and silver. In the latter class the gold value is in excess of all other constituents. Silicified areas of rhyolite carrying free gold form another type of deposit which might be designated as blankets. The value in this type is very erratically distributed; mill runs have been made on $20 ore but the average value is probably nearer $5 per ton.

Gash veins in the rhyolite are mineralized by gold, silver and minor amounts of galena and pyrite. Quartz-filled fissures are neither numerous nor well mineralized. There has been some faulting in parts of the district but in most cases the displacement is slight.

Several Properties of Small Development

The property which has received the most recent publicity is the Australitz, which is situated in the northwestern part of the district near the town of Oro Blanco. This deposit is a flat vein 4 to 12 ft. wide carrying gold and silver associated with pyrite and chalcopyrite. The mine is credited with having produced approximately $90,000 from a small ore shoot. It has been developed by about 800 ft. of adit and one shaft 125 ft. off the vein. The property is now idle. The Montana, about three miles east of the Australitz, is the best example of the replacement type of vein. A shear zone, approximately 100 ft. wide, has been more or less replaced by quartz. About 20 ft. on the hanging-wall side of this zone has been well mineralized by an intimate mixture of lead and zinc sulphides carrying silver and minor amounts of copper sulphide. This property has developed a large tonnage and is being worked.

West Outcrop of Montana Mine

To the south of the Montana, the McDonald and Old Glory properties are located on areas of silicified rhyolite. These mines are credited with a production of over half a million dollars. Some development work is being carried on at the McDonald property. South of Old Glory are the Oro Blanco and Tres Amigos mines. The latter is developed by many thousands of feet of adits and shafts but is now idle. Mineralization occurs in both the breccia and silica-replacement types of deposits.

South of the Warsaw is the Grubstake. This mine is the best example of breccia type of vein. The breccia is 4 ft. wide, carrying good values in free gold. The property is being worked and test mill runs indicate that over 75% of the gold can be saved by amalgamation. West of the Grubstake is the Oro mine, where a shaft 340 ft. deep has followed a quartz vein in which gold in pyrite is the principal mineral. It has a small crew of men developing the oreshoot. Southeast of the Grubstake is the Nelson property where a shaft and adits are reported to have developed considerable gold ore. The deposit is of the breccia type. While this list does not include all the properties in the district, it does include most of those on which serious work has been done.

Working Conditions

An exceptionally good class of Mexican labor is available for prospecting purposes. Wood and water are scarce but sufficient exist for preliminary work. Many places afford excellent sites for storage dams; in fact, there are several of these dams in the district now. Transportation is the chief difficulty. In the mineralized area there are no good roads. Freight to and from the railroad varies from $8 to $20 per ton. In a word, the working conditions are those met with in all the outlying districts of the Southwest.

Recent Oil Developments in Texas and Louisiana

By W. E. Wrather*

Oil developments in Texas and Louisiana have been of unusual interest during the past summer. Within a period of four months, three new pools have been discovered, two in the heavy-oil district along the Gulf Coast, and one in the light-oil district of northwestern Louisiana. It is yet too early to do more than guess at their probable extent and productivity, but despite this fact they justify a feeling of optimism, particularly the two heavy-oil discoveries, which have revived the hope that the Gulf Coast region may continue an important producer of fuel oil for some time.

The failure to find new pools of importance, together with the steady decline of old production and the attendant rise in the price of fuel oil had grown alarming. In June, 1908, when the Goose Creek and Markham pools were discovered, the coastal fields were producing between 45,000 and 48,000 bbl. of oil per day. Both developed into small pools, in which it has been impossible to secure and maintain any reliable production. In September, 1910, the Vinton pool in southwestern Louisiana was discovered. It also proved of small extent though very prolific. The producing area of the field covered about 60 acres, which to date has produced approximately 6,250,000 bbl. of oil and is now making about 5000 bbl. daily.

The present total daily output of the nine older heavy-oil pools is about 21,000 bbl. This oil has constantly gained in favor with the refiners as it has become better known, and perhaps half of the total present production is refined. The daily average consumption of the railroads in the Southwest alone is estimated at 26,500 bbl. A large industrial consumption has been built up in this section also, and even though large quantities of residuum are supplied to the fuel-oil trade by the refineries, a deficit arises, to meet which Mexican oil is being imported at Gulf ports at the rate of 800,000 to 1,000,000 bbl. per month. This amount will probably be increased as soon as additional tankers are available, unless home production can be increased to meet the shortage. Despite the importation of Mexican oil, which can be roughly valued laid down at American ports at 75c. per bbl., the price of heavy oil in the coast fields has risen to $1 to $1.25 per bbl. The high sulphur content of Mexican oil, its corrosive properties, disagreeable burning odor, and heavy gravity, militate against its becoming as popular with consumers as the lighter gravity, more fluid fuel produced here, though the railroads are largely turning to it from necessity. The Southern Pacific R.R., through its subsidiary, the East Coast Oil Co., is now a large producer of Mexican oil, and at present is using it exclusively for fuel on its Texas and Louisiana lines.

The two new coastal pools are located, one in extreme southeastern Texas near Orange, the other at Edgerley, about 25 miles further east, in southwestern Louisiana. At Orange, the Rio Brave Oil Co., the fuel department of the Southern Pacific R.R., on Aug. 17, completed a 250-bbl. flowing well at a depth of 3150 ft., the deepest commercial oil yet found along the Gulf Coast with the exception of the 3300-ft. oil north of Humble. A few days earlier, the Gulf Refining Co. finished a 2350-ft. well at Edgerley, which flowed 600 bbl. of jet-black oil, testing 15° (Baumé) gravity, with considerable salt water. Judging from the unusually heavy gravity of the oil, the main pool at Edgerley has probably not been tapped.

Both pools evidently belong to the familiar "salt dome" type, though at neither place has rock salt nor crystalline gypsum yet been found. As no surface elevation is apparent, it is thought that perhaps the salt core will prove to be too deeply buried to be reached in ordinary drilling, as at Batson and Jennings. Pronounced surface-gas seepages at these two localities have attracted attention since the discovery of oil at Spindletop in 1901, and several test walls have been drilled at each place.

The light-oil pool of northwestern Louisiana is at Mansfield, about 45 miles east of south from the Caddo field. On May 10 the Gulf Refining Co. brought in a 1500-bbl. flowing well, which is at present flowing about 500 bbl. daily from a depth of about 2400 ft. The formation encountered is almost identical with that at Caddo, the gravity of the oil is the same (44° Baumé), and it seems extremely probable that the pool will prove to be located on the same, or on a structural fold parallel to that which determines the north-northwest axis of the Caddo field. This supposition cannot be justified, however, by the surface geology as the region is one of slight relief, largely mantled with alluvial soil along Red River, and too few drill records are available to be of service in showing the attitude of the sand. It seems however, that there is a gentle dip eastward into Red River Parish, as well as southward. The shallow gas sand (800 ft.), which has furnished such phenomenal gas wells at Caddo, is here gas-bearing also, but the gas wells seldom exceed 4,000,000 or 5,000,000 cu.ft. per day, and it is unlikely that the gas will prove much of an asset, aside from furnishing fuel for development.

The production of the Electra field in north Texas continues to increase steadily. On Jan. 1, 1913, it averaged 15,000 bbl. daily, and it is now estimated at over

*Beaumont, Texas.

25,000 bbl. This increase is due in large part to the deep-sand (1900-ft.) wells on the southwest side of the field, which frequently make as much as 400 to 800 bbl. each. They would no doubt be much larger wells if the oil contained a larger amount of gas. A shortage of gas is typical of this entire district outside the Petrolia gas field, which shows as great gas pressures as any gas field in the United States. The deep sand has been proven to extend over about four sections of land, which area, though known to be productive, has been sparsely drilled. It makes a valuable reserve for the field, and may be expected later to swell still further the total production.

The Burkburnett area has proven a disappointment thus far. It now covers equally as much acreage as Electra, but the total daily production will not average more than 1000 bbl. The wells are 1800 ft. deep, and seldom pump more than 25 to 50 bbl. per day. Lately the productive area has been crowded westward where several 150-bbl. wells have been found in shallower sands. In fact, it now seems evident that there will ultimately prove to be a continuous productive area stretching west-southwest from Burkburnett to Electra, 18 miles. Already at six places along this line paying wells have been found at varying depths. Sands of a given depth will likely be local, which is typical of the broken, erratic character of the pay sands in this district; and while this 18-mile stretch will hardly prove to be a continuous, unbroken pool, it appears that there is some hidden structural feature having this general trend, which has governed the accumulation of the oil.

Michigan Mining Interests in Spitzbergen

SPECIAL CORRESPONDENCE

The Arctic Coal Co., controlled by John M. Longyear, of Marquette, Mich., and associates, has in 1913 shipped 35,000 tons of coal from its mines in Spitzbergen, within the Arctic Circle. The coal has gone to continental ports. The company owns two steamers, one the "Kwasind," of 3800 tons burden, that regularly carries coal in the shipping season, the months of July, August and September, and the "William D. Monroe," a whaler that is used in transporting supplies, but it depends for most of the tonnage it needs on season charters.

It is 10 years since Longyear's attention was first directed to the coal resources of Spitzbergen, and the present stage of the Arctic company's enterprise represents eight years' continuous development, conducted on a constantly increasing scale.

Great sums of money have been spent in the field by Longyear and his associates, and the only returns so far have been the few cargoes sent to civilization. But the region possesses tremendous resources in coal and if all goes well the men interested in the Arctic company will be richly rewarded both for their daring and the persistence of their efforts to have the international status of Spitzbergen satisfactorily determined.

The shipment of 38,000 tons of coal to southern ports this year was more than has been forwarded in any previous season and more, also, than will likely be forwarded next year, for the shipment was incidental to the development of the property. The stage of actual mining on a commercial basis has not yet been reached. However, the preliminary work has been well advanced and Longyear expects that the company's operations will soon be definitely determined. Much equipment will have to be installed before the property is in readiness for production on a large scale. The general manager is Scott Turner.

A deposit of more than 60,000,000 tons has been indicated by the operations to date. The mines are wrought by 250 to 300 men, and, although the shipping season lasts but three months, mining is carried on throughout the year. The geological conditions place no bar on successful mining in the Spitzbergen fields. The beds are uniform to a surprising degree, running about 3½ ft. thick, and the mining problem is simple. The coal is undercut, and drops from the sandstone capping which overlies it. The sandstone makes a stable roof and has to be supported with comparatively little timbering. However, other conditions raise some question as to what part of the coal can be taken out.

The international phase of the matter is one that continues to give concern to the men interested in the company, for Spitzbergen remains No Man's land, and although the Arctic company holds title to its 170 square miles of land by purchase from a Norwegian company, by exploration and by possession, it is regarded as an interloper by the northern nations of Europe, and its rights may not be established without a fight.

In fact, the company's land has already been entered upon by a force of Russians, who have undertaken exploration and who have carried it forward sufficiently so that they have shipped a cargo of coal. What to do about these invaders is only one of the many problems that give concern to the officials of the Arctic company. There is a strong suspicion that they have pursued their course with the knowledge of the Russian government.

Norway has made several attempts to bring together representatives of eight leading nations in a conference in which steps will be taken to determine the status of Spitzbergen, but so far the conference has failed to eventuate. It seems impossible to agree on a time when all the powers are willing to settle down to the task of determining how Spitzbergen shall be governed, or what rights will be respected there.

The officials of the Arctic Coal Co. have met with no more success obtaining satisfactory assurances about the backing it will get from the American state department than Norway has encountered in bringing the powers together to deal with the subject. In one of President Taft's messages reference was made to the anomalous condition existing in Spitzbergen, and the necessity of protecting American interests, but so far there has been no more definite declaration that Americans who have made investments in Spitzbergen will be protected by the Government in the final scramble for land and power.

That this is the case is not due to a lack of representations by officers of the company to the state department, but to the reluctance of the officials of that department to act finally on the matter. Longyear has frequently had the matter before the undersecretaries, and recently discussed it with Solicitor General Folk and other officials. This last interview gave Longyear considerable satisfaction and he is hopeful that steps will soon be taken to define the position of the American government in relation to Spitzbergen. With the Russians aggressively in possession of tracts of the company's land, and showing every evidence of a purpose to go ahead and mine coal, this naturally is a matter of great interest to the men who have staked so heavily on the exploitation of the Spitzbergen coal fields.

Jones & Laughlin Interests on the Cuyuna

A recent deal in ore lands on the North Cuyuna range is of interest both as illustrating the manner in which the business is conducted and as marking the probable entrance of the Jones & Laughlin interests on the range. Thomas Feigh, of Duluth, owns the fee to a group of four forties forming a square block adjoining the Pennington on the west and southwest. He leased this land to the C. M. Hill Lumber Co., at $0.35 per ton royalty. The company drilled and opened up a good body of ore, thereafter selling the lease to the Northern Pacific for $250,000. The Northern Pacific in turn has given an option to Jones & Laughlin. Whether the royalty remains the same is not stated nor what the minimum tonnage is to be. It is probable that the railroad has, as usual, stipulated haulage over its tracks and will take its profit from the freight charges. It is reported that check drilling is to begin soon.

The deposit indicated by the first drilling, taken as a whole, has a shape something like the half of an egg that has been split lengthwise with the plane surface upward forming the outcrop. In this body the rich ore occurs as a series of inclined lenses, more or less parallel, striking a little north of east, this being the long axis of the deposit. Several of the lenses are larger and of more importance than the others. The dip is rather flat, 40 to 50°. The drilling has pretty well bottomed the ore, although cross-sections show possibilities of downward extension in a few of the lenses. The total tonnage calculated for the holes is 3,250,000. To uncover this will require the stripping of 3,125,000 cu.yd. of drift and 600,000 cu.yd. of rock. The average depth of the overburden is perhaps 80 ft. It is calculated that 100 ft. of the deposit after stripping can be steam shoveled, equivalent to a tonnage of 1,750,000. The remainder of the ore will require milling or underground mining.

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Mica Deposits in Canada

Concerning the importance of Canada as a mica-producing country, interesting information is given in a report issued by the Department of Mines in a pamphlet by J. McLeish, says the *Canadian Engineer*.

With the exception of Ceylon, Canada is the only country, as far as known, in which phlogopite—or "amber mica"—is known in economic quantities. The mica of commerce is of two kinds—muscovite, or "white mica," and phlogopite, or "amber mica." The former is obtained from both India and the United States, while the latter is secured almost wholly from Canada. Of the two varieties, phlogopite commands rather the higher price, being softer, more flexible and more suitable for use as an insulator, this being the principal use to which mica is now put.

The amber-mica deposits of Canada lie in approximately 1200 square miles in the province of Quebec, and 900 square miles in the province of Ontario. The two districts are separated geographically by the Ottawa River, and geologically by a belt of sedimentary rock about 40 miles wide. The city of Ottawa lies between the two productive areas and is the seat of the mica industry, all the important works engaged in trimming and in otherwise preparing the mineral for the markets being situated there.

Deposits of white mica also occur in Canada, and occurrences of this variety (some few of which have been worked at various times) are known from Labrador in the east to the Rocky Mountains in the west, while several Arctic expeditions have returned with good specimens from the far north.

Though the average dimensions of mica sheets do not much exceed 3x5 in., plates of enormous size are sometimes obtained. Crystals have been found which measured over 4 ft. across and weighed nearly two tons. About 300 mines have been worked for mica at various times in Canada, but at the present day no more than 25 are in active operation. Among the large operators may be named: The General Electric Co., of Schenectady, N. Y.; Webster & Co., Ottawa; Blackburn Bros., Ottawa; Wallingford & Co., Ottawa; O'Brien & Fowler, Ottawa; Kent Bros., Kingston.

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Single-Track Cableway in Sardinia

By E. Praetorius*

A cableway of unique design, herewith illustrated, was installed at the Rosas mine in Sardinia. Its novel feature consists in the fact that the two buckets travel on the same rope, provision for passing at the midpoint being made in an ingenious manner. To the carrier of each bucket are attached two arms extending parallel to the track rope, and above it. These arms are pivoted where attached to the carrier and the one on the ascending side is kept elevated above the rope by means of a flat steel spring inserted below it. The tops of these arms form tracks which take the wheels of the other carrier just as the rope does.

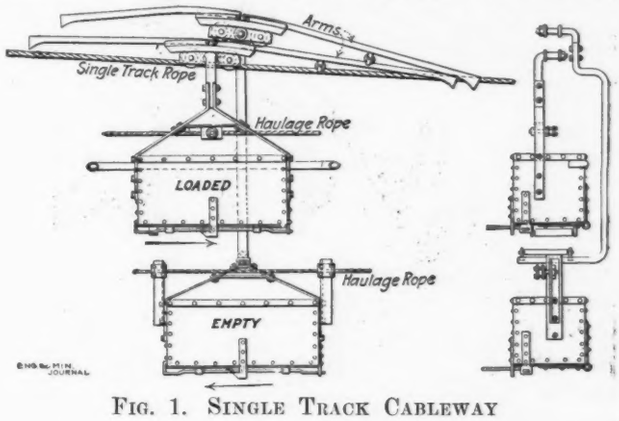


Fig. 1. Single Track Cableway

When the buckets meet, the carrier wheels of the ascending bucket mount the carrier arms of the descending bucket and ride over them. The spring in the upper arm yields under the weight of the ascending bucket, so as to permit the arm to come down on the rope and deliver the carrier wheels to the rope again. The ends of the arms are made fantailed so as to guide them to the rope. As will be seen in Figs. 1 and 2, one bucket is suspended from the carrier by a much longer arm than the other, this arm having an offset portion to permit the passage of the other bucket.

The length of the cableway is 1115 ft. (340 m.) and it overcomes a difference in elevation of 223 ft. (68 m.). The track rope is ¾ in. in diameter (19 mm.) and the haulage rope is $\frac{5}{16}$ in. (8 mm.). This haulage rope lies

*Miniera di Rosas, Rosas, Sardinia.

in the same vertical plane as the track rope and passes over vertical sheaves at each terminal. This sheave at the loading station is provided with a rim brake to control the speed. The arrangement at the discharge station is shown in Fig. 2. The weight of each bucket and carrier is 220 lb. (100 kg.) and it carries a load of 660 lb. (300 kg.). The speed of the buckets is such that the 1116 ft. is covered in 65 to 70 seconds.

Whereas the installation does not have carrying capacity equal to that of a system employing two buckets with two track ropes, yet by experiments carried out it is found that there is only a difference of 27% against this system. By using a system of four buckets on two ropes, an advantage of 56% is gained. The construction was done at the mine under unfavorable circumstances. Nevertheless, the cableway has run five months without a single hitch, or without any repair expense whatever and during this time has carried 3000 tons of lead ore.

[The great span, high speed and the light weight of rope of the installation are points worthy of note. The device is extremely ingenious, and appears to be quite practicable. Comparison would naturally be made, however, not as Mr. Praetorius says, with two buckets running on two ropes, but with a cableway of the single-rope type in which no track rope is provided, the haulage rope serving as well to keep the buckets suspended.—EDITOR.]

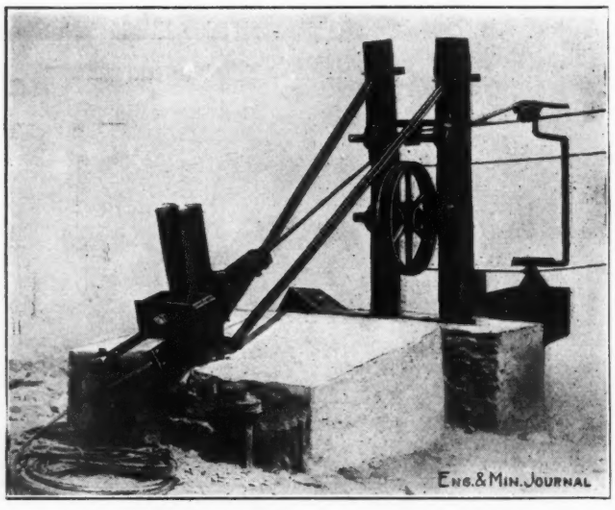


FIG. 2. DISCHARGE TERMINAL WITH VERTICAL SHEAVE

Electric Production of Ferrochrome

A new industry has just been started at Trollhattan, Sweden, in which the electric furnace is used for the reduction of ores brought from South Africa and New Caledonia. Two furnaces are now in operation, using 3-phase, 50-cycle current at a voltage varying between 45 and 60, according to *Daily Consular and Trade Reports*. Four grades of metal are being made, containing 5, 6½, 7½ and 9% of chromium. The finished product is exported.

The process is a secret one and entrance into the works, which is owned by the Ferrolegeringar Aktiebolag, is forbidden. The manager, Louis Lucchèse, who is also the inventor, explained that as yet no patents had been applied for, and hence the only protection was secrecy.

The output for the year 1913 will reach about 1200 metric tons. It is stated that the furnace requires 1700 kw.-hr. per ton of metal reduced, and that the results thus far obtained are very satisfactory.

Manufacture of Aluminum in France

An interesting summary of the present status of the manufacture of aluminum in France is given in *La Revue Electrique*, of Sept. 5, 1913.

Five French companies produce aluminum. These are: The Société Electrometallurgique Francaise, Compagnie des Produits Chimiques d'Alais et de la Camargue, the Société des Forces Motrices et Usines de l'Arve, the Société des Produits Electrochimiques et Electrometallurgiques des Pyrénées, and the Société d'Electrochimie.

These five companies have formed another company, L'Aluminium Francaise, which acts not only as sales agent, but is also intended to carry out research work on the applications of aluminum, and to devote itself to a propaganda to encourage its greater consumption. This company also manufactures, in its plant at Selzaute, Belgium, and Mennessis, France, considerable quantities of alumina, sulphate of aluminum, etc. It is now erecting at Arrean, in the Pyrenees, an aluminum factory and at Chambery, Savoy, a rolling mill for the manufacture of aluminum sheets, etc. At Kremlin-Bicêtre, near Paris, it has a factory for making tubes, etc. The present status of the five constituent companies is briefly:

Société Electrometallurgique is Dr. Paul Héroult's company formed in 1888, the oldest of the French electrometallurgical companies. Its capital is 15,500,000 francs. In the different plants of the company at Froges, La Praz, Saint-Michel-de-Maurienne, and L'Argentiere 65,000 to 70,000 hp. are available during the greater part of the year. Besides aluminum ingots, bars, wire, cables, tubes, aluminum cooking utensils and pure alumina, the company produces ferro alloys, electric steel (Héroult process) and carbon electrodes. Compagnie des Produits Chimiques d'Alais et de la Camargue was founded in 1855 and its capital is now 10,500,000 francs. Its plant at Salindres was originally intended to manufacture soda by Le Blanc's process, but later was devoted successfully to chlorine manufacture and began, in 1861, to produce aluminum by the purely chemical process of Henri Sainte-Claire Deville. For 30 years it was the sole producer of aluminum. In 1897 it bought the Calypso aluminum plant and later equipped another hydro-electric plant, now producing considerable quantities of aluminum.

Société des Produits Electrochimiques et Electrometallurgiques des Pyrénées was founded in 1906, and has a capital of 6,000,000 francs. Its Auzat plant has a capacity of 16,000 hp., and its output is 6 tons of aluminum, 9 tons of chlorates or perchlorates and 10 tons of calcium carbide or ferro alloys daily.

Société des Forces Motrices et Usines de l'Arve was founded in 1895, and has a capital of 4,100,000 francs. Its Chedde plant has a capacity of 22,000 hp., and its maximum output is 6 tons of aluminum and 20 tons of chlorates and perchlorates per day. The Société d' Electrochimie was founded in 1889 by Gall and de Montlaur for the electrolytic production of potassium and sodium chlorates and has a capital of 10,000,000 francs. In its numerous plants the company produces chlorates, aluminum, calcium and calcium hydride, potassium and sodium cyanides and other chemical products.

Stoping Methods at the North Star Mine

By L. O. Kellogg

SYNOPSIS—Because of its flat dip and irregular nature, stoping the North Star vein presented unusual difficulties. Levels driven at 300-ft. intervals. Muck lowered to levels by "go-devil" gravity-plane method. Special type of head-block. Three stages in stope development. Advantages and limitations of system. Costs of preparatory work, breaking ore and mucking.

The North Star mine, of Grass Valley, Calif., is so well known as to make any general description of its operations superfluous.[1] It is engaged in mining gold ore under circumstances favorable in some respects, but highly unfavorable in others. The greatest difficulty encountered lies in the characteristics of the deposit. The vein is a narrow one, ranging in width from 6 in. to 5 ft. While persistent on strike and dip, it is erratic in width, dip, strike, thickness and grade. Although it is practically unfaulted in the portion now mined, it splits frequently into two or three narrow parallel veins, separated by areas of country rock up to 10 or 15 ft. thick. While the gold content would make its grade medium or even high for a larger, more uniform deposit; on account of the waste which it is necessary to mine with the vein material to get room for machine stoping, it is in effect a low-grade deposit. The oreshoots, furthermore, are extremely irregular in size and shape.

General Method of Development

The dip of the vein is about 23°, so far as developed. The first mining was done by an incline shaft in the vein from the outcrop to the 2700-ft. level. Later, at a point some distance in the direction of the dip, a vertical shaft, the Central, was sunk, cutting the vein at a depth of 1630 ft. The workings tributary to this shaft might be described as the North Star Deep, as the term is used in South Africa. At a point slightly above this, a station was cut and the 40 level established, approximately 4000 ft. on the incline below the outcrop. Beginning at this station, the vertical shaft is turned and follows the vein as an inclined shaft from that point to the bottom about 100 ft. below the 53 level, or about 5400 ft. on the incline below the outcrop.

Material below the 40 level is handled by skips in the turned-vertical shaft, these being pulled through the 40 station without transfer. Material from the 40 level is trammed to the 40 station and is picked up there by the skips. Material from the levels above the 40 is lowered through a main raise on a gravity plane by an engine, especially designed for the purpose, is dumped into the 40 bin and is thence hoisted to the surface.

Levels are driven, three to the 1000 ft., measured on the incline. Thus the "deep" levels above the 40 are the 37, 34 and 30. Above the 27, all operations were formerly carried on through the North Star inclined shaft mentioned, but these have been discontinued except for pumping and repair work; all the ore now mined comes from below the 27 and is hoisted through the Central shaft.

[1]See Eng. and Min. Journ., Nov. 18, 1911.

Ore Handling in Stopes on Gravity Planes

The main raise, through which material is lowered, has loading stations at the 37, 34 and 30 levels, spaced something over 300 ft. on the incline. To these bins the ore is trammed from both sides of the raise by mule or by hand, according to the length of the haul and the tonnage handled. The spacing of the levels and the method of delivering the ore to the level were the problems that had to be met. Experiment with various systems led to the one now in use. It is exceedingly neat and efficient and peculiarly adapted to the conditions obtaining.

The ore from the block above is got to each level by means of gravity planes. These are locally and aptly call "go-devils." They are peculiar in the fact that the cars that are used for tramming in the stopes are lowered on the plane by means of a light portable and easily controlled triple-sheave head-block. A typical stope in process of working by the go-devil method is diagrammatically illustrated in Figs. 7, 8, 9 and 10, plans in the plane of the vein.

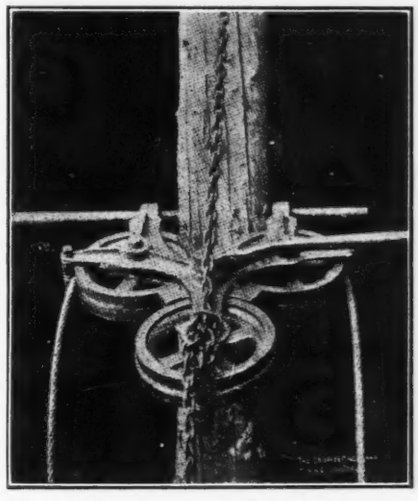


Fig. 1. Go-Devil Head Sheave in Position on Post

The Go-Devil Head-Block

The go-devil head-block is probably the most interesting feature of the method. It is illustrated in Figs. 1 and 2. The rope passes up on the outside of the outside blocks, down the inside through grooves in the brake block, and around the bottom of the lower sheave. The brake block is triangular, pivots about its center in between the three sheaves and is operated by a handle attached to the square head shown. It is brought to bear on all three sheaves and thus gives a strong braking effect. It can be locked in position by extending the handle with a piece of pipe and connecting the end of this to a lever with a ratchet lock set on a stout post. The two halves of the triangular spider-frame, the three sheaves and the brake block make six castings entering into the device, beside the bolt, nuts and handle. The manner of suspending the block by a bolt through the post and by a chain, is shown in Fig. 1.

A 5/8-in. steel-wire rope is used and is attached by means of the safety hook shown in Fig. 3. The cars are in general of two types. That formerly used was built of wood bound with strap iron, and had a vertical front. The door was hinged at the top and was held by a bottom latch, which was tripped by a block beside the track just as the dumping point was reached. These cars were of different sizes, but were rather small, holding about 1000 lb. They have been almost entirely displaced by the car shown in Fig. 4. This car is built rigid throughout and its emptying is facilitated by the inclined end. Its strength is one of its features, as it has to withstand extremely hard usage. Its capacity is about 16 cu.ft.

Manner of Operation

Whichever type of car is used, it is dumped by partly upsetting at the foot of the incline. This is effected by the device shown in side elevation in Fig. 5. The last 2 ft. of the incline tracks are made steeper and a round timber resting against two inclined posts as shown, is set across the bottom, over the last tie. The wheels of the dumping car rest on this bumper. In the center of each of the tracks is a hook, usually of 1¾-in. grooved steel; one end is hooked over the next to the last track tie, the other projects upward so as to catch the front axle of the descending car. The axle is caught as the front wheels hit the bumper. The inertia of the car and contents causes it to revolve about this axle and to tilt up until the top of the body rests against the crossrail on the inclined posts. In this position the end and bottom of the car are at an angle to permit easy discharge of the contents, aided by the inertia of the descent.

The cycle of operations is as follows: The mucker or trammer fills a car at some point along the lateral tracks; he trams it to the turnsheet and hooks on the loose end of the go-devil rope; he pushes it carefully over the edge on the track and grabs the brake handle, the empty car at the dump is jerked back so that its rear wheels are again on the rail and as the full car descends, the empty one is pulled up. The length of the rope is adjusted so that, as the full car reaches the dump and empties, the empty car is landed on the turnsheet, whence it is trammed out on the lateral tracks for loading again.

The incline plane itself is kept on as uniform a grade as is convenient. It is built of 4x6-in. crossties, about 8 ft. long, spaced 3 ft., these are held apart by studdles of the same material, which are laid on 1x6-in. boards; the boards give no support and are used merely for lining in and getting grade. The ties themselves are supported either on the foot wall or on filling, or on poles across low places. Four 12-lb. rails are spiked to the ties, so as to give a double track from top to bottom with 20-in. gage and 12 in. clearance. The general arrangement is illustrated in Fig. 6.

Stope and Raise Relations

To return to the general method of developing the vein, the development by levels is augmented by raises on the vein wherever conditions warrant. In putting up these raises, go-devils are used. On starting a raise, the muck is blasted to steel sheets on the level tracks and is shoveled into cars. When enough advance has been gained, a chute is put in. When the face is too far above this chute for rapid shoveling, a go-devil is installed. In a raise, no turnsheet is used and the two cars are always on the rope.

The raises may or may not be in ore. A stope may be started between two raises, extended to each, and may use a go-devil in each raise, it may be started on both sides of a raise and may use a single go-devil in the center, or it may be started in unexplored ground and an entirely new go-devil installed near the middle. In describing the development of a typical stope, we may consider one started on two sides of a raise, which is itself in ore.

Stope Development

The first operations consist in drilling holes along the face. Usually two stoping points are selected, one on each side of the raise, and each stope carried toward the raise in one direction and to the limits of the oreshoot in the other. The first ore is shot down on plats, usually covered with steel sheets, laid over the level tracks. The stope soon assumes a shape as shown in Fig. 7.

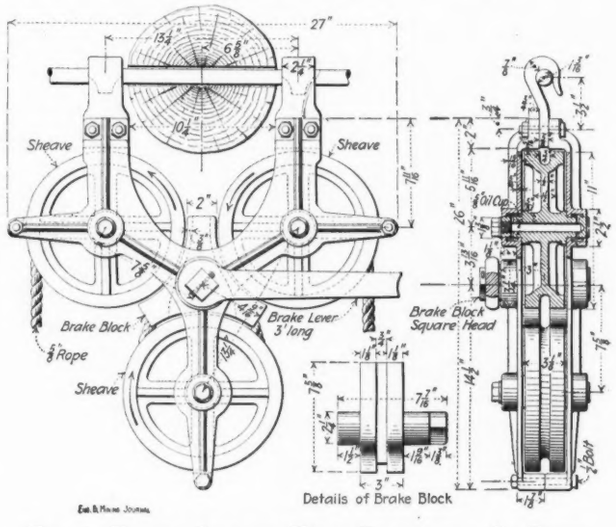


Fig. 2. Triple-Sheave Head Block for Go-Devil Gravity Plane

The foot wall of the vein has usually been carried pretty well up on the drift side, so that after two or three cuts have been shot out, a shoveling plat can be erected, the height of a car or higher. Such a plat is illustrated in Fig. 11, consisting in its simplest form of 2-in. planks, covered with steel, set at right angles to the track on a round timber supported by two stulls. In the same way, small chutes or lips can be put in to deliver directly to the cars without shoveling if the vein is steep enough.

In this manner the stope is carried up until its face is somewhat above the top of the raise chute. About 30 ft. on the dip may have been thus mined. It is squared up and the pillars next the chute are removed. Then a row of stulls is placed within about 5 ft. of the stope face and horizontal poles, with a minimum diameter of 6 in., are set against these so as to keep the broken rock on the intermediate level. The face has previously been drilled up for its full length. Stopers are used for nearly all drilling in the stopes. When the stope is thus "poled," it looks as in Fig. 8. The holes are blasted, beginning at the raise and the ore is thrown toward the raise, whence it is shoveled into the chute. When this first cut has been carried so far that shoveling becomes slow, a water Leyner

or a "jackhamer" is used to shoot up the foot wall, making a level cut about 5 ft. wide. This foot-wall breaking is done with long "lifters" or with numerous "pops" about at right angles to the foot wall; the "lifters" are also drilled with stoping drills if circumstances permit. On this flat grade, a track is laid both ways from the chute and the broken ore is handled with cars thenceforth. A cross-section of part of the stope, Fig. 12, shows the poling and track.

A number of cuts are started at the raise and carried back until the stoped portion along the raise measures from 25 to 30 ft. The stope may then look somewhat as in Fig. 9. The ore is blasted on steel sheets or on 2-in. planks, laid on the tracks until some distance is gained up the dip, when the raised plats are put in as when stoping along the level.

Stoping with Go-Devil

The lift is then squared up by carrying back each cut to the limit of the ore; the face is drilled up, and poling again put in. At the same time the Leyner machine is used to break out a place for a turnsheet in the raise foot wall at the level of the new poling and a turnsheet is placed there; a post to carry the go-devil blocks in the raise above the turnsheet is also set and the dumping device at the chute top. The first ore blasted is shoveled into cars fastened to the go-devil rope and then lowered and dumped. Stoping proceeds away from the raise as before and when the track is installed, the cars are handled on the go-devil as previously described. The tracks and ties from the lift below are used.

This operation is repeated until the oreshoot in that block is worked out. Fig. 10 shows the appearance of a stope in which six lifts have been made. The economical length of each lift, measured up the dip, is calculable, being determined by comparing the cost of installing the new poling, track and turnsheet, including loss of time, with the cost of shoveling down from the face. The poling serves to keep the broken ore at or above the track level, and also acts as a partition between ore and waste, the coarse waste being thrown below, where it is available for building dry-wall supports to the roof when desired. It must not be supposed that the stulls of the poling are the only ones set. As a matter of fact, stulls are placed at frequent intervals throughout the stope as needed. Each new lift entails the use of a longer rope.

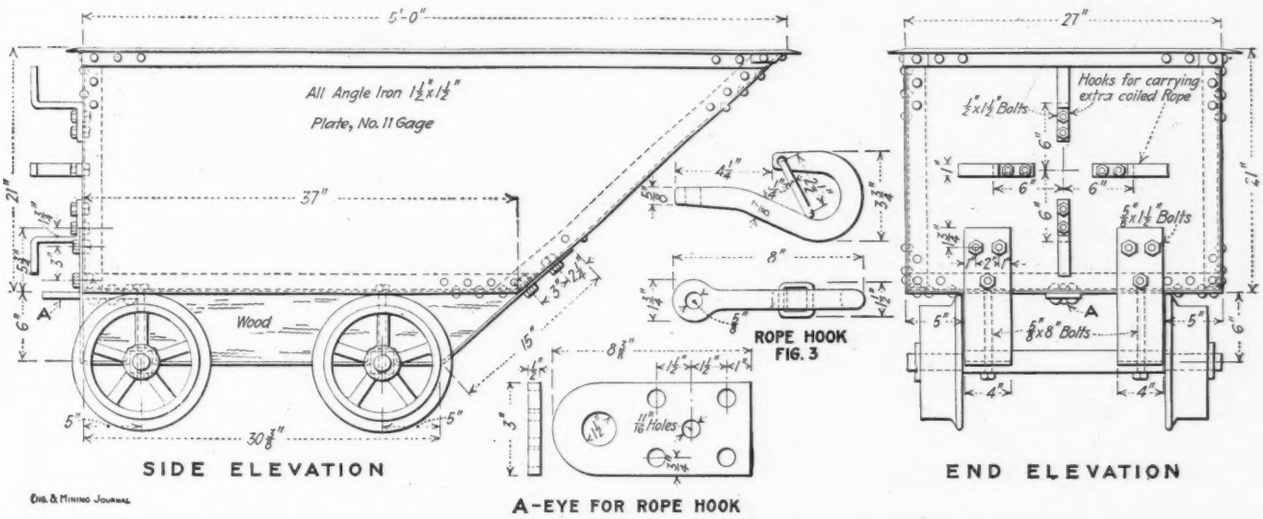
Advantages of System

The advantages of the system as a method of handling material in a flat-dipping stope are numerous:

(1) It reduces to a minimum the necessary shoveling. While it is still necessary, as each lift reaches its upward limit, to shovel the ore twice, this is nothing compared with systems where the muck may require shoveling over 100 ft. The shoveling is furthermore made easier by the use of plats where possible.

(2) It eliminates much dead work. Except for the track grading and occasionally some main-level chutes, the work is all in the ore; no long crosscuts are run.

(3) It has great capacity. Three cars in a stope will handle the product of four or five machines. Its capacity is especially noticeable as compared with shaking chutes, which were tried and discarded. About 10 to 15 go-devils supply a daily mine production of 350 tons.



Figs. 3 and 4. Go-Devil Rigid Car and Safety Hook for Rope Attachment

(4) There is no consumption of power, as is the case in hoisting from underhand stopes or from workings down the dip, nor is there any expense for a man on the hoist.

(5) It is cheap in the final results and not so expensive in material as might be at first supposed, inasmuch as cars, ropes, blocks, turnsheets, trucks, ties and poles are used over again until worn out, and are often taken to other stopes.

(6) It involves a minimum rehandling of material except at the level, as compared with systems using a series of chutes down the stope with intermediate tramming.

(7) It reduces the number of main-haulage drifts with a consequent reduction in development cost, first cost of bins and cost of tramming.

(8) Its great advantage is its flexibility. As can be seen, it can take care of a stope of any size or any shape. By sending out the lateral tracks at 30-ft. intervals, the limits of the oreshoot can be outlined exactly. If, in any case, the ore hooks down into the waste as shown at *A*, Fig. 10, it is only necessary to return to one of the lower

levels, when the stope is worked out, and continue it as a small drift so as to tap the offshoot from below.

Limitations

There are, however, certain disadvantages and limitations:

(1) Sufficient headroom over the tracks is necessary to allow the car with a projecting rock to clear the roof. To obtain this means considerable expense in cutting out the foot wall. The hanging is left intact as nearly as possible.

(2) It will not operate below a 5° and with difficulty below a 10° dip, and conversely when 35° is reached, its operation becomes difficult and sometimes dangerous.

(3) The slowing down of operations and decrease of output upon cleaning up, beginning a new lift, is a source of trouble and makes it difficult to keep up production if several stopes are "moving" at the same time.

(4) There is some danger of accident. The cars, especially the empty car as it is jerked back to the track, may be derailed. More disastrous are the runaways of one or both cars on the incline. These may happen in several ways. The operator may push over the loaded car without hooking on the rope; the hook occasionally drops off on starting; the rope or hook may break; the lower car may become unhooked, in which case the brake often fails to hold the unbalanced load; the operator may allow the speed to increase until he cannot control it with the brakes; some part of the head block may fail. In any event, the resulting runaway is a merry one. A ton and a half of car and ore on a steep grade, possibly 250 ft. long, will land in the chute with an appreciable impact. Its extraction is an awkward job, calling for an hour's work or more by all hands and the shift boss. Neighboring stopes may be drawn upon for men, and the cost of such an accident in damage, loss of time and in-

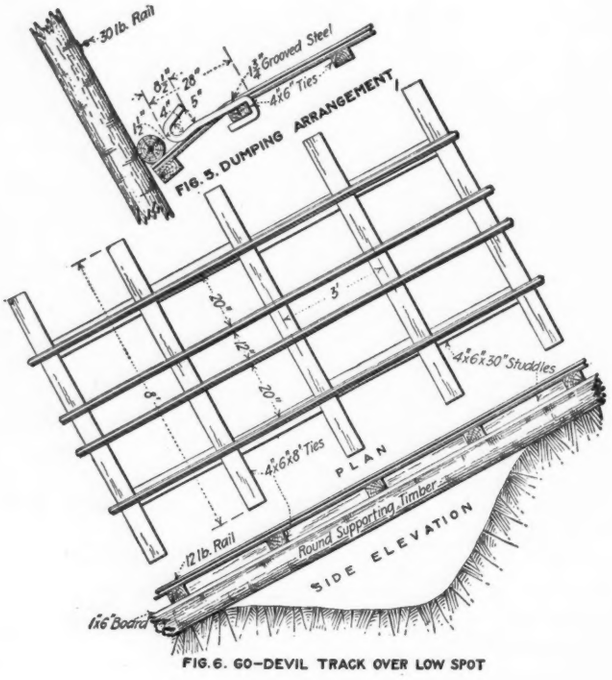
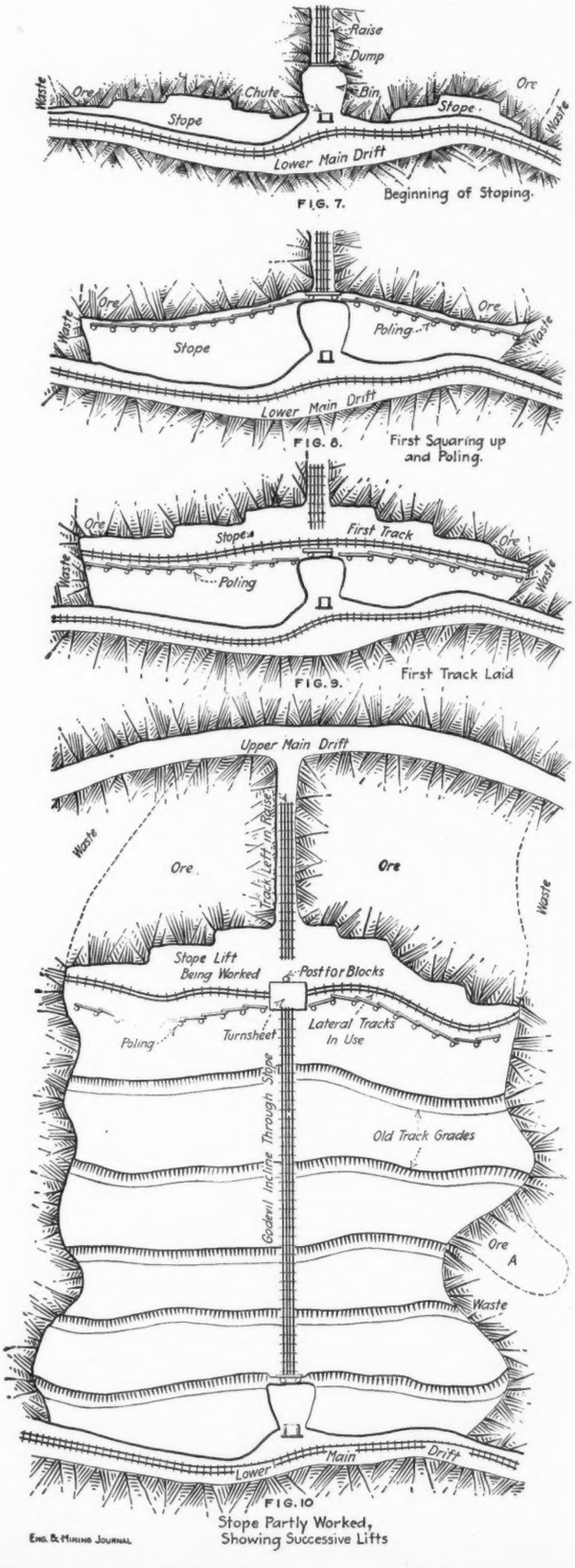


FIG. 6. GO-DEVIL TRACK OVER LOW SPOT

Arrangement of Gravity Plane and Dumping Device



Stope Plans, Showing Progressive Development

terruption of work in the stope, may amount to $25 or $50 in some cases. It should be noted that the applicability of the system is greatly increased by the unusually good hanging wall.

Preparatory Costs

In regard to costs: Where the stoping operations utilize the go-devil in an old raise, the cost of the go-devil construction is properly charged to the original raising. The installation of successive turnsheets, however, involves breaking and replacing the old inclined track to such an extent that little of it is actually used. The cost of laying go-devil tracks, as with most of the other of these costs, will vary exceedingly, according to the degree of uniformity of dip, accessibility of working, height of hanging wall, etc.; the labor cost varies from $0.60 to $0.80 per lin.ft. The cost of rail and timber for a new go-devil will average from $0.50 to $0.60. The cost of the dump, bin, chute, etc., is similarly usually chargeable against the original raise and when new work must be done for stoping, conditions are so variable as to make figures valueless.

Poling is also subject to considerable variation, depend-

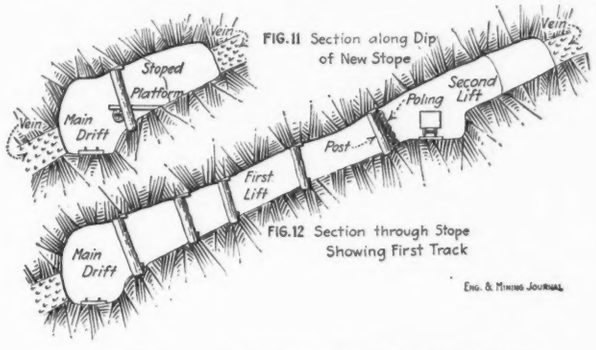


FIG. 11 Section along Dip of New Stope

FIG. 12 Section through Stope Showing First Track

Stope Sections during Early Operations

ing on the accessibility of the stope and on the width. The stulls are rounded on the foot-wall end and are set in hitches. The timbermen who do this work are paid at the rate of $3.25, the uniform shift being eight hours. Labor will vary from $0.10 to $0.33⅓ per lin.ft. Material cost will vary according to the number of old poles employed. A rough average would be $0.25 per ft. along the stope for all labor of setting stulls and poling.

Taking up the bottom for track is also variable. A miner using either a Waugh, "jackhamer" or water Leyner will shoot up from 6 to 10 ft. of bottom per shift. The machine costs, such as power, repairs, etc., will be noted when breaking ore is considered. Explosive cost is low, as the holes break to good advantage. Track laying is rapid and cheap. Rails and ties from the lift below are usually used. About $0.10 per ft. would cover the labor of removing track from one lift and laying it on a new grade. The total cost per foot for the intermediate track complete is about $1, and amounts to $0.07 approximately per ton stoped.

Actual Stoping Costs

These costs mentioned cover preliminary or incidental costs, dead work in a sense. For actual stoping, although costs may vary greatly with conditions in the individual stopes, more constant figures can be given, being obtained from totals of the whole mine over considerable periods of time. About seven tons per drill shift is broken in stopes. The machinemen get $3. Machine costs per drill shift over the whole mine are: Power, $0.40; repairs, $0.40; lubrication, $0.02; and drill-steel sharpening and replacement, $0.75. The amount of powder used per ton is 1.65 lb., with 5.8 ft. of fuse and 0.9 detonators. A stope hole breaks on an average 1¼ tons. The steel consumption using 12 A Waugh stopers is 2¼ lb. per drill shift.

The average shoveling rate in the stopes is about seven tons per man-shift. Two rates are paid for shoveling labor, $2.50 and $2.25, and an average would be about $2.35, giving a shoveling cost of $0.35 per ton. This is the total cost of getting the material into the main-level chutes at the bottom of the stopes, and includes whatever sorting is done underground. The average stoping width of the material sent to the mill is about 4 ft. Lowering is performed at various speeds, depending on the grade, condition of track, skill of opertor, etc. Speeds varying from 200 to 500 ft. per min. have been observed.

Other minor operations are involved in the system of stoping, which add to the cost, such as setting the turnsheet for a new lift, setting the go-devil post and block, etc. It should be noted that the breaking and shoveling costs are referred to the material sent down the go-devil, all of which goes to the mill. A large amount, from 10 to 20% of the material broken, is coarse waste, which must be handled and which is sorted and thrown over the poling in the stope; if included in the tonnage figures, this would boost appreciably the duty per man-shift.

Fineness of Fairbanks Gold

Placer gold is generally believed to increase in fineness, the farther it is removed from its source in the vein. The assumption is theoretically sound, and is confirmed by field evidence, although few published facts on the question are to be had. Writing in *Economic Geology*, August, 1913, Philip S. Smith furnishes some data concerning the fineness of the gold in the Fairbanks region, Alaska, obtained from the assayer for the Washington-Alaska Bank of Fairbanks. It appears that the gold does increase in fineness with removal from its source. Increases of 3, 6, 6½, 12½, 13 and 21 points out of a thousand, are noted per linear mile on various creeks of the district. The fact that results are not constant is largely due to the varying relations between the creek and the auriferous veins. A creek running parallel to the vein formation receives continually new accessions of gold which has not been worked over.

Fullers Earth in the United States

American production of fullers earth began when the deposit at Quincy, Fla., was discovered in 1893. A previous discovery at Alexander, Ark., in 1891, is recorded, but was not commercially important, according to the U. S. Geological Survey. In 1912, 32,715 tons were produced. Seven states are responsible for the output: Arkansas, California, Colorado, Florida, Georgia, Massachusetts and Texas.

Fullers earth is principally used in this country for bleaching and clarifying fats and oils. Its production in 1912 represents a decrease of 7982 tons, or 19.61%, from that of the previous year.

Kennedy Extension-Argonaut Apex Testimony Closed

By Lewis H. Eddy*

The evidence in the apex suit of the Kennedy Extension Gold Mining Co. vs. the Argonaut Mining Co., was concluded on Nov. 6, and adjournment was taken to Dec. 8, when the argument of the attorneys will be heard. The trial of the case began on Sept. 15 in the superior court of California for Amador County, at Jackson, before Judge F. V. Wood, sitting without a jury. The evidence adduced was chiefly of expert character by men of wide reputation as mining engineers and geologists and was altogether an interesting procedure that drew the attendance of a large number of practical mining men from various parts of the Mother Lode region, and some of the owners of Mother Lode mining property, whose residences are in San Francisco.

The chief witnesses for the plaintif were Dr. John W. Finch, Prof. R. D. George, state geologist of Colorado, William G. Devereaux, manager of the Melones mine in the Angeles Camp district, in Calaveras County, and Vance C. Osmont. The attorneys for the plaintiff present in court are Solinsky and Wehe and Perry & Dailey, of San Francisco. The chief witnesses for the defendant were Prof. Andrew C. Lawson, of the department of geology, University of California; R. S. Rainsford, general manager of the Argonaut Mining Co.; Fred Searles, Jr., of the Gold Fields Consolidated; Prof. Walter H. Wiley, of Los Angeles.

The attorneys for defendant in court were Judge Curtis H. Lindley and William J. McGee, United States assistant treasurer at San Francisco. The plaintiff company sought to show that the Argonaut workings extending beyond the Argonaut east side line and into the ground beneath the surface of the Kennedy Extension ground had been driven into the vein having its outcrop and apex within the Kennedy Extension ground. The defendant company sought to prove that while the Argonaut vein dips flat in the upper ground and straightens up to about 60° at the point, it is a continuous vein which has its outcrop and apex within the Argonaut ground. While the direct testimony offered by the plaintiff company was devoted to what is called the Muldoon-Jackson vein, rebuttal testimony was offered regarding the Argonaut (Pioneer) vein.

A large part of the testimony of Professor Lawson and Doctor Finch concerned the faulting along which the Argonaut vein is developed, and the general geology of the immediate country; but both witnesses testified as to the workings of the respective mines and as to the continuity of the vein according to their respective theories and opinions. The testimony of Mr. Rainsford was chiefly regarding the practical operation of the Argonaut and a statement of the mining geology and physical features of the mine.

Mr. Searles presented the results of his observation as to the orebodies involved in the controversy and also described the Argonaut vein as to its character and continuity from observations made, for the purposes of this suit, in the varied employments of a working miner and mining geologist. Mr. Searles had spent about three months familiarizing himself with the property and for four or five months in the same year, 1910, worked as a miner for the purposes of this suit. Professor Wiley testified as to the geological and physical features of the Argonaut after spending about 40 days on the surface and underground.

All of the expert witnesses have been engaged at the Argonaut and Kennedy Extension constantly since the trial of the suit began and some of them were there prior to that time. Much of the evidence adduced in the trial was based upon development and exploration carried on by both sides and in both properties during the trial. Both companies have worked together and each had access to the ground of the other during all the time that the suit has been pending. Members of the Kennedy Extension Gold Mining Co., are owners by purchase of 200 shares of Argonaut Mining Co.'s stock, so that the officers and attorneys had access to the office records of the Argonaut Mining Co. Since the filing of the suit in 1909, the Argonaut has been debarred from paying dividends and for that reason has accumulated a large surplus. The money demands of the action, including the ore extracted and the value of alleged damages, will total about $1,000,000. A large amount of money has been expended by each side for lawyers' fees and the fees of expert witnesses and the preparation of maps and models.

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New York Garnets

The principal garnet mines in the United States are located in Warren and Essex Counties, in the eastern Adirondacks in northeastern New York. A description of the mines of Warren County is given by William J. Miller in Bull. No. 538 of the University of the State of New York. These mines all lie within six or eight miles of the village of North Creek, a terminus of the branch of the Delaware & Hudson. The country rock is entirely pre-Cambrian, consisting of igneous rock together with metamorphosed sediments. The three mines being worked at present are the Rogers, Sanders Bros. and the Hooper, although there are four other localities where mining has been carried on.

At the Rogers mine the size of the garnets is of unusual interest. The matrix is a gray medium-grained nonquartziferous gneiss, through which the numerous, translucent, reddish-brown garnets are well scattered. Those with diameters up to 5 or 6 in. are common and the largest taken out are said to be the size of a bushel basket. The garnet is of the almandite variety, usually badly crushed or coarsely granulated and always without crystal outline. The remarkable feature is the never failing occurrence of a rim or envelope of pure black, medium-grained hornblende crystals completely inclosing each garnet. Occasionally, a ½-in. irregular mass of acid plagioclase or a crystal of biotite may lie between the garnet and the hornblende rim. The width of these rims usually varies with the size of the garnets, some being as much as 2 or 3 in. The reddish-brown garnets completely surrounded by the black hornblende rims, which are in turn embedded in the gray gneiss, present a striking appearance in the walls of the mine pits. The garnet-bearing rock is fully ¾ of a mile long with a nearly east-west strike. Several large openings have been made and in the largest, most easterly, pit the width of the deposit is more than 100 ft. The garnet rock is removed by blasting, reduced by sledge hammers and the garnets picked out by hand.

At the Sanders Bros. mine the garnets occur in a

mixed gneiss area with granitic syenite and Grenville rock interbedded parallel to the strike of the foliation. These bands are 20 to 40 ft. wide, made up largely of a granular, medium-grained mass of irregular crystals of reddish-brown garnet and a bright-green pyroxene. There are some streaks of nearly pure garnet. The garnet-pyroxene rock is crushed, put into barrels and shipped without sorting.

At the Hooper mine the garnets occur in crystals, often with good boundaries, up to an inch or more in diameter, thickly scattered through a medium to moderately coarse-grained, gray, gneissoid, hornblendic rock with the composition of a basic syenite or an acidic diorite. No rims of hornblende occur here, although in some cases the garnets are nearly surrounded by feldspar. The deposit is extensive and a large pit has been opened. After blasting the rock it is broken with sledges and trammed to the mill, where it is crushed. In the mill, separation is performed by the use of jigs.

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Zinc Sulphite Solutions

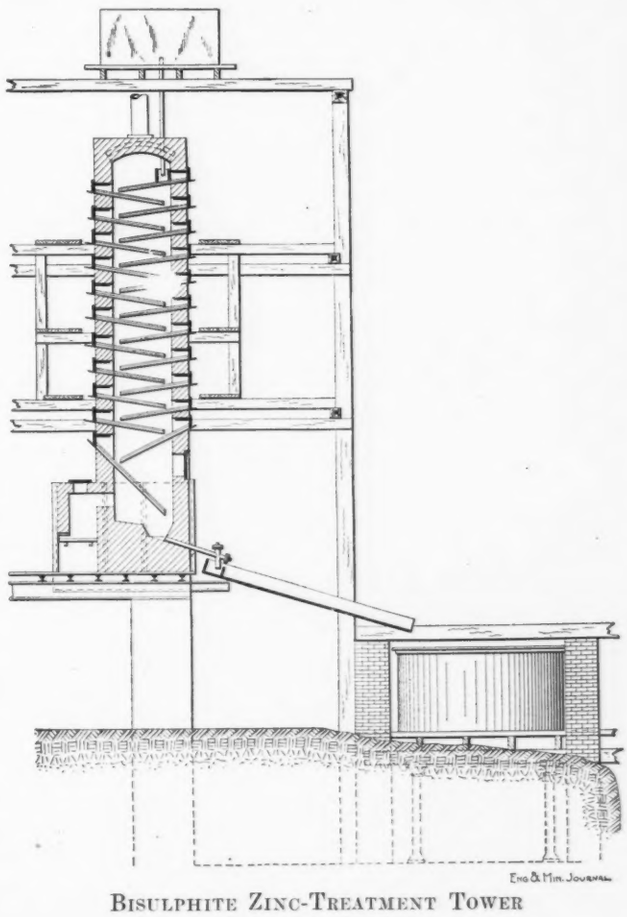
H. L. Sulman and his associates, who are interested in the so called "bisulphite process" of zinc extraction, have done much work in studying the behavior of the compounds of zinc with sulphurous and sulphuric acids. More or less of this is revealed in their patent specifications. The following data are from U. S. patent No. 1,074,203, granted to H. Rees and H. L. Sulman, of date Sept. 30, 1913.

Solutions of bisulphite and sulphate of zinc, such as those resulting from the treatment of roasted complex ores with aqueous sulphurous acid undergo little or no change when heated to a temperature of 80° C., unless the period of heating is prolonged, in which case some sulphur dioxide is expelled from the solution and a small amount of zinc monosulphite may form as a scum on the surface or fall as a slight precipitate, not, however, in a basic condition. The sulphate of zinc contained therein remains quite unaffected and soluble. If, however, a continuous current of liquor be made to flow filmwise over a series of plates or shelves heated either externally or internally, the zinc salts are deposited from the solution more or less completely, frequently in a more basic condition.

The apparatus used by Rees and Sulman for this purpose is shown in the accompanying engraving, which is self-explanatory. In its operation sulphur dioxide is evolved from the liquor, and after the saturation limit of the colder inlet liquor by sulphur dioxide is reached, the excess of this gas continually evolved in the lower portion of the tower, escapes with the cooled combustion gases. Under these conditions the behavior of such a solution is quite different from that of the same solution when heated in bulk to the same temperature as that of the liquor finally issuing from the tower. Thus it has been found that monosulphite of zinc is readily separated from the films of liquid thus treated, and that in some cases it is partially decomposed into zinc oxide with loss of sulphur dioxide; further, that zinc sulphate is also to a small extent rendered insoluble possibly being converted by interaction with the zinc oxide, into a basic sulphate.

There are several basic sulphates of zinc known which have been isolated such as the tetrabasic salt, $ZnSO_4\ 3ZnO$, the hexabasic salt, $ZnSO_4 5ZnO$, and the octobasic salt, $ZnSO_4 7ZnO$. A basic sulphate of zinc may be produced by heating the normal sulphate until it is partially decomposed and it is possible that some small proportion of zinc is formed in this way on the hottest portion of the shelf plates of the tower; the major portion, however, is produced by the the action of the zinc-sulphate liquor upon zinc oxide arising from the decomposition of the zinc sulphite, these joint reactions occurring on the shelves of the precipitation tower. These separated solids partially escape in the solution issuing from the apparatus, and partially remain as film accretions on the inclined plates or shelves, from which they may be removed periodically by scraping.

The solutions employed in the bisulphite process are dilute and the precipitation of the zinc sulphate therefrom depends to a certain extent upon the proportion of bisulphite which is precipitated from the solution as monosulphite. The zinc sulphate would not precipitate by itself, but requires the precipitation of the monosulphite or oxide to bring any zinc sulphate out of solution.



BISULPHITE ZINC-TREATMENT TOWER

With highly sulphated roast there might not be sufficient monosulphite to effect the precipitation of any zinc sulphate, but any deficiency can be made good by adding to the dilute solution a sufficiency of either zinc oxide or zinc monosulphite. These additions are made to the solution before it is exposed filmwise on the shelves of the heated tower or the solution may be subsequently agitated for a short time with these reagents at a temperature of about 80° to 90° C. The result is that the zinc as bisulphite in the solution is precipitated as monosulphite and

this, together with the added monosulphite, or zinc oxide, or both, secures the precipitation of some of the zinc sulphate in admixture therewith and in a basic condition.

In the particular apparatus described, the bottom slabs or shelves of the tower, i.e., those nearest to the stove, may be heated to a comparatively high temperature, as for example, from 300° to 800° C., or even more; here the largest and most basic accretions form. This, however, does not communicate the same degree of temperature to the liquor films passing over them, for, as previously stated, the liquors escaping from the tower are, as a whole, heated to a temperature of less than 100° C. By increasing the height of the tower and the heat imparted to the liquors by means of the stove gases, increasingly basic precipitates may be obtained.

The following dimensions and quantities may be taken as a practical embodiment of the tower type of apparatus: Height of tower, 13 ft. Cross-sectional area of the tower, 21x21 in. Number of shelves, 19 (the lower three shelves being composed of refractory material, such as fire-tiles.) Inclination of all except the bottom shelf from the horizontal, 10°. Inclination of bottom shelf from the horizontal, 45°. Area of each shelf, 2.77 sq.ft. (21x19 in.) Size of coke grate, 4 sq.ft. Volume of liquor passing through apparatus in 24 hours, 50 tons of 2000 lb. Temperature of lowermost shelf on its underside, approximately 800° C. Cross-sectional area of gas-way at constricted portions opposite the bottom edge of each shaft, 0.44 sq.ft. (the area of the gas-way, however, varies at different points of its length).

Calculating Weight of Stacks

The accompanying table was compiled by Charles R. Courtenay for use in estimating the weights of circular steel stacks and smoke breechings (*Amer. Machinist*, Sept. 11, 1913). The table gives the actual weight of a round steel tube 1 ft. long, including longitudinal lap. For stacks No. 8 to No. 3 gage, it is only necessary to add $\frac{1}{12}$ or $8\frac{1}{3}\%$ of the weight given for every girth seam in the stack.

Example—How much will the plate of a 22-in. diameter by 20-ft. stack weigh if the material is No. 16 gage stock and the length of each section, including lap, is 50 in. From table, weight per foot = 16.4 lb., $20 \times 16.4 = 328$ lb. There are four girth seams $= \left(\frac{20 \text{ ft.} \times 12}{50}\right.$ = 5, nearly; $5 - 1 = 4$) $8\frac{1}{3}\%$ of $16.4 \times 4 = 5.46$ lb. extra weight for seams (girth) $328 + 5.46 = 333.46$ lb. total weight of plate in stack.

If the gage stock had been No. 0 to No. 6, we would have had to use $15\frac{7}{8}\%$ instead of $8\frac{1}{3}\%$, as the lap for these gages is $1\frac{7}{8}$ in. instead of 1 in. for the lighter-gage stock. In order to obtain the total weight of material in a stack, it is only necessary to add to the plate weight the weight of rivets and bands.

WEIGHT-CALCULATION TABLE. WEIGHT PER FOOT OF ROUND STACKS

	Use ¼" Rivets—Lap 1¼"								Use 1/16" Rivets—Lap 1"										
Diameter	0	1	2	3	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30
	16"	16"	16"	4"	16"	16"	16"	16"	16"	4"	4"	16"	32"	8"	8"	32"	64"	64"	64"
8										11	7.6	6.1	4.9	3.68	3.04	2.65	1.82	1.52	1.23
9										12.4	8.55	6.8	5.5	4.02	3.51	2.73	2.05	1.71	1.34
10									17	13.8	9.4	7.8	6.06	4.53	3.78	3	2.27	1.87	1.53
11									18.7	15.	10.4	8.31	6.64	4.97	4.14	3.22	2.49	2.07	1.66
12									20.3	16.4	11.3	9.04	7.36	5.41	4.51	3.61	2.71	2.26	1.84
13									22	17.7	12.2	9.8	7.8	5.85	4.82	3.91	2.93	2.45	2.01
14									24.3	19	13.1	10.51	8.41	6.46	5.24	4.2	3.15	2.62	2.10
15									25.3	20.4	14.1	11.2	9.	6.73	5.61	4.49	3.37	2.81	2.22
16								33.7	27	21.7	15	12	9.58	7.17	5.98	4.79	3.55	3	2.49
17								35.6	28.6	23	15.9	12.7	10.2	7.51	6.34	5.08	3.74	3.18	2.5
18								37	30.3	24.4	16.8	13.4	10.8	7.96	6.71	5.37	4.03	3.36	2.64
19								39	32	25.7	17.7	14.2	11.3	8.49	7.17	5.66	4.25	3.54	2.86
20							49	41	33.6	27	18.7	15	11.9	9.2	7.44	5.95	4.47	3.73	3.0
21							51.5	43	35.2	28.4	19.6	15.6	12.5	9.47	7.81	6.25	4.69	3.91	3.15
22							53.8	45.1	36.9	29.7	20.5	16.4	13.1	9.81	8.17	6.54	4.91	4.1	3.36
23							55.9	47.1	38.5	31	21.4	17.1	13.7	10.2	8.54	6.73	5.13	4.28	3.45
24							58.7	49.1	40.2	32.4	22.3	17.8	14.3	10.6	8.9	7.12	5.41	4.46	3.56
25						65.8	61.1	51.1	41.8	33.7	23.2	18.6	15	11.1	9.27	7.42	5.57	4.65	3.68
26						68.3	63.5	53.1	43.5	35	24.2	19.3	15.5	11.5	9.64	7.71	5.79	4.82	3.86
27						71	66	55.2	45.1	36.3	25.1	20.1	16.04	12.1	10.	8	6.01	5.02	4.01
28						73.5	68.2	57.2	46.8	37.7	26	20.8	16.6	12.3	10.3	8.3	6.23	5.2	4.15
29						76	70.6	59.2	48.4	39	27	21.5	17.2	12.8	10.7	8.59	6.44	5.38	4.30
30				89.8	84.3	78.6	73	61.3	50	40.4	27.8	22.3	17.8	13.3	11.1	8.92	6.67	5.57	4.45
31				92.8	87	81.2	75.4	63.2	51.7	41.7	28.7	23	18.4	13.8	11.4	9.18	6.89	5.75	4.59
32				95.7	89.8	83.8	77.8	65.3	53.4	43	29.7	24.1	19	14.2	11.8	9.47	7.16	5.93	4.74
33				98.6	92.6	86.3	80.2	67.2	55	44.4	30.6	24.5	19.6	14.6	12.2	9.76	7.33	6.05	4.89
34				101.6	95.3	89	82.6	69.3	56.7	45.7	31.5	25.2	20.2	15.1	12.5	10	7.55	6.3	5.09
35			111	104.5	98.1	91.4	85	71.3	58.3	47	32.4	26	20.7	15.5	13	10.3	7.77	6.42	5.16
36			114.2	107.4	100.8	94	87.3	73.3	60	48.4	33.3	26.7	21.3	16	13.3	10.6	7.92	6.6	5.33
37			117.3	110.4	103.5	96.6	89.7	75.3	61.6	49.7	34.3	27.4	21.9	16.3	13.6	10.9	8.26	6.85	5.48
38			120.4	113.3	106.2	99.1	92.3	77.4	63.3	51	35.2	28.1	22.5	16.8	14.01	11.2	8.49	7.02	5.63
39			123.5	116.3	109	101.7	94.5	78.7	65	52.3	36.1	28.9	23	17.2	14.4	11.5	8.68	7.15	5.77
40	149.2	134.1	126.6	119.2	111.8	104.3	97	81.4	66.6	53.7	37	29.6	23.7	17.7	14.8	11.8	8.89	7.39	5.92
42	156.4	140.7	132.9	125.1	117.2	109.4	101.6	85.4	70	56.4	38.8	31.1	24.9	18.5	15.5	12.3	9.34	7.76	6.14
44	163.7	147.3	139.1	131	122.8	114.6	106.4	89.5	73.2	59	40.7	32.5	26.03	19.4	16.2	12.9	9.75	8.07	6.5
46	171	153.9	145.4	136.8	128.3	119.6	111.2	93.5	76.5	61.7	43.5	34	27.2	20.3	16.9	13.5	10.1	8.45	6.8
48	178.4	160.5	151.6	142.7	133.8	125	116	97.6	79.8	64.3	44.3	36.1	28.4	21.2	17.6	14.2	10.6	8.82	7.09
50	185.7	167.2	157.9	148.6	139.3	130	120.7	101.6	83	67	46.2	37	29.6	22.1	18.4	14.6	11	9.18	7.39
52	193.1	173.7	164.1	154.4	144.8	135.6	125.5	105.6	86.4	69.7	48	38.4	30.7	23.1	19.1	15.3	11.5	9.6	7.68
54	200.4	180.4	170.3	160.3	150.3	140.3	130.3	109.7	89.8	72.4	50	40	31.9	23.8	19.9	15.9	11.9	10	7.97
56	207.8	187	176.6	166.2	155.8	145.5	135.1	113.7	93.5	75	51.2	41.4	33.1	24.7	20.6	16.5	12.3	10.3	8.27
58	215.1	193.6	183	172.1	161.4	150.6	139.8	117.6	96.5	77.7	53.5	42.6	34.3	25.6	21.3	17.1	12.8	10.7	8.56
60	222.4	200.2	189.1	178	167	155.7	144.6	121.8	99.7	80.3	55.4	44.3	35.4	26.5	22	17.6	13.2	11	8.85
62	229.8	206.8	195.3	183.8	172.4	160.8	149.4	125.8	103	83	57.2	45.8	36.9	27.4	22.8	18.2	13.7	11.4	9.15
64	237.1	213.4	201.6	189.7	178	166	154.2	130	106.3	85.7	59	47.2	37.8	28.2	23.5	18.8	14.1	11.8	9.4
66	244.5	220	207.8	195.6	183.4	171.2	159	134	109.6	88.3	60.3	48.7	39.3	29.2	24.2	19.4	14.6	12.1	9.7
68	251.8	226.6	214	201.4	189	176.4	163.7	138	112.9	91	62.7	50.2	40.3	30	25	20	15	12.5	10
70	259.1	232.2	220.3	207.3	194.3	181.4	168.5	142	116.2	93.6	64.5	51.6	41.4	31.1	25.7	20.6	15.4	13	10.2
72	266.5	238.8	226.5	213.2	200.5	186.8	173.3	146	119.5	96.3	60.4	53.1	42.7	31.8	26.5	21.2	16	13.4	10.6
	Add 15⅞% of above for each girth seam.									Add 8⅓% of above for each girth seam.									

These weights include allowances for over weights as adopted by The Ass'n American Steel Mf'rs.
Does not include bands, guy wire and rivets.

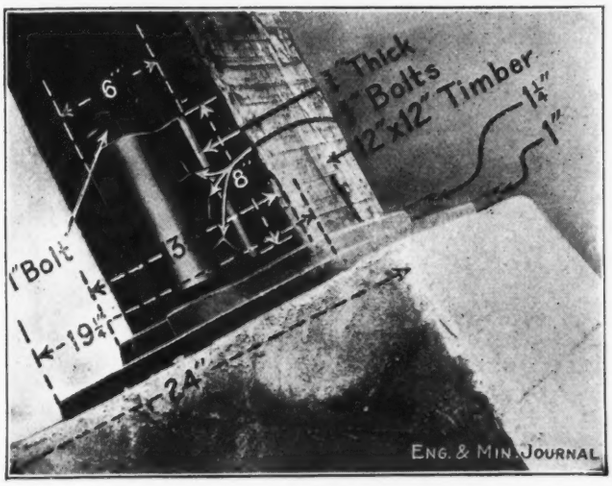
⁂

Shipping Oil to Batum is very like the traditional "shipping coal to Newcastle." A correspondent of the London "Mining Journal," however, reports that the Transcaucasian Ry. in Russia, the western terminus of which is near Batum and the oil region, has contracted for 2,000,000 poods of American petroleum residuum to be delivered at once, and proposes to take 15,000,000 poods in all.

DETAILS OF PRACTICAL MINING

Anchoring Device for Wood Headframe

The accompanying photograph illustrates the method employed to hold down the posts and backstays of the timber headframes used by the Cuyuna-Duluth and the Cuyuna-Mille Lacs companies on the North Cuyuna



DETAILS OF ANCHORING DEVICE

range. A separate concrete pier, measuring 24 in. square on the top, is built to carry each member. The anchoring device consists of three castings with eight sets of bolts and nuts. One casting is set on the concrete and used as a base plate. The upper portion of this is a socket 1¼ in. deep and 13¾ in. square outside. The 12x12-in. timber rests in this upon the bottom portion, which is 19¼ in. square and 1 in. thick. Lugs are cast on two sides of the socket portion and the two 1-in. foundation bolts pass through holes in the lugs. Two bolt sockets on opposite sides of the timber receive the foundation bolts. These are of the shape shown in the illustration, the metal being ¾ in. thick, the socket 8 in. long and the width of the base portion 6 in. where it bears on the timber. Six ⅝-in. bolts pass through both sockets and hold them to the timber. This would seem to be a neat and efficient way of anchoring a headframe.

❋

Fire-Damp Whistle

At the opening of the Kaiser Wilhelm Institute for Chemistry, a year ago, the Emperor expressed the hope that science would discover some means of guarding human lives against explosions in mines. On Oct. 28, when he visited the building for the opening of the Institute of Experimental Therapy, he was shown apparatus which, it is claimed, fulfills this hope, says *The Science and Art of Mining.*

The apparatus, which is the invention of Privy Councilor Haber and Dr. Leiser, is called a "fire-damp whistle." Its purpose is to warn miners of the existence of poisonous or inflammable gas in a pit in time to enable them to retreat in safety. The underlying principle is that the whistle when blown in pure air produces an even-toned continuous sound, while when blown in air containing other gases it sends forth tones varying from a shrill tremolo to a jerky staccato, according to the extent of the atmospheric adulteration.

The whistle consists of a metal cylinder 10 in. long by 2½ in. in diameter, and is operated by means of an air pump. It is audible for a distance of over 300 ft. Experiments carried out with pure and contaminated air for the benefit of the Kaiser revealed distinct differences of tone.

❋

Substantial Surface Air Pipe Line

The accompanying illustrations show the general method employed by the Witherbee-Sherman company, at Mineville, N. Y., for installing the pipe line which con-

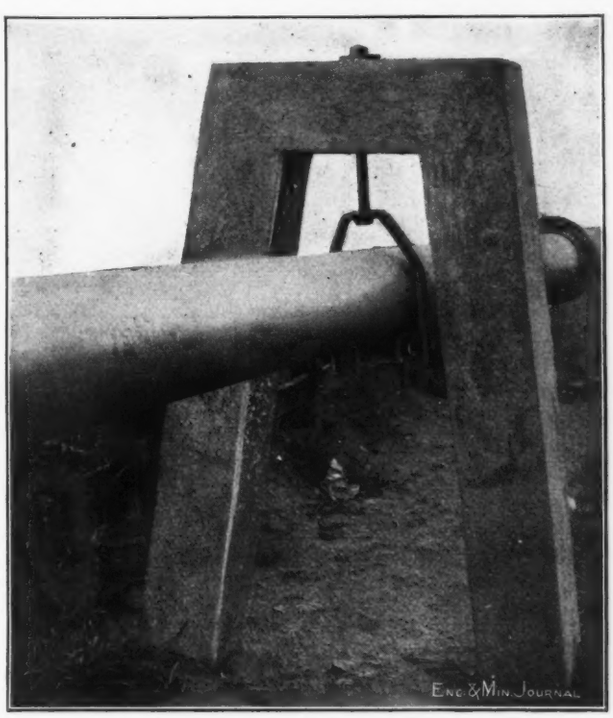


FIG. 1. CONCRETE BENT, SHOWING PIPE AND HANGER

ducts compressed air from the central air-generating station to the various mine entrances. The line has been built in two sections, the first being of 12-in. pipe and extending from the compressor house to the Joker power house, about 1300 ft. In this case the pipe was supported on bents made up chiefly of pipe, the pipe of the cap serving as a roller. The air pipe merely rested on the cap. As a result of bulging, set up by the linear expansion and contraction of the line, side motion on the

bents resulted, and the line required watching to prevent the pipe from falling off the bents.

Increases in operations at Barton Hill necessitated an extension of the line to that point. The company, as the result of a property purchase, had come into possession of a large quantity of 7-in. and 8-in. pipe and the desirability of using this determined the diameter of the pipe in the extension rather than any calculations of volume, velocity and friction loss. The line is 4300 ft. long, 1000 ft. of this length being of 7-in. pipe. Concrete bents were used in general, spaced 20 ft., but in certain cases where greater height was desired to cross roads or because of topographic conditions and also because the waiting for the concrete to set introduced awkward delays at times, wooden bents were substituted. A series of such wooden bents on one side of a road is shown in Fig. 3.

The concrete bents, of which one is well shown in Fig. 1, were cast in place; there is a concrete sill or foundation in the ground to complete the bent. Reinforcement is obtained with two pieces of old 1⅛-in. cable, each piece forming a complete loop through the cap, legs and foundation sill, the ends overlapping in the sill. The average height of the concrete bents is about 4 ft. 10 in. To maintain grade for the pipe, bents of varying height were, of course, necessary. This was provided for by lengthening the legs of the forms. The legs and cap are about 8x8 in. in section, the sill is somewhat larger. The cap is 27 in. across the top. A vertical hole through the center of the cap permits the insertion of a ⅞x16-in. bolt with a rectangular ½x3x4-in. washer to bear on the concrete. From this bolt hangs the bridle shown, made of ½x2-in. material. A ⅞x12-in. machine bolt forming the bottom of the hanger, provides a bearing for the iron roller, on which the pipe rests. This roller has a concave surface, the concavity having a slightly greater radius than the pipe. It is 6 in. long, including one 1-in. projections on each end, which gives additional bearing. The center portion is about 2 in. in diameter. The wood bents are also of 8x8-in. section.

The rollers permit of so easy a motion along the pipe line that provisions to take care of expansion need be inserted only at infrequent intervals. The ells at the corners, such as that shown in Fig. 2, serve this purpose and there are several of these, inasmuch as the line follows a rather tortuous course. In the longer straight stretches, and where necessary, slip joints are inserted and anchoring provided to control the pipe motion.

Concrete is extensively used by the Witherbee-Sherman company, since the tailing piles furnish excellent sand and aggregate up to 2 in. in size. The substantial design of the entire installation is the result of a desire to keep maintenance charges at zero, an attempt that has been successful so far. The pipe and the wood bents are all well painted.

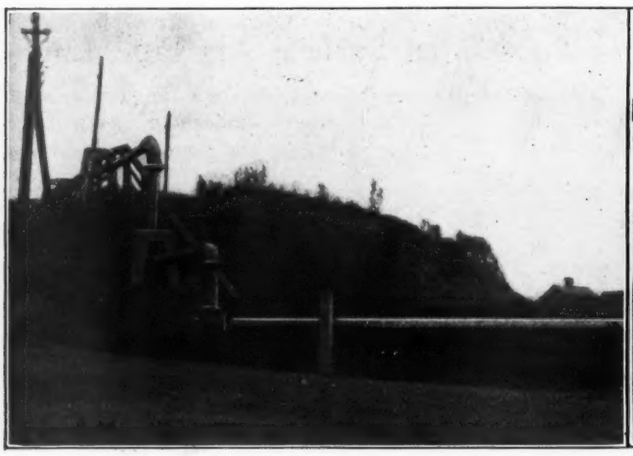


FIG. 2. PIPE LINE TAKING A TURN AND OVERCOMING DIFFERENCE OF ELEVATION

FIG. 3. HIGH WOODEN BENTS CARRYING THE LINE OVER A ROAD

Don'ts for Detonator Users

The following instructions of the E. I. du Pont de Nemours Powder Co. are published by *Coal Age,* Oct. 11, 1913:

(1) Don't forget the nature of blasting caps, but remember that with proper care they can be handled with comparative safety.

(2) Don't smoke while you are handling blasting caps, and always keep them away from lights.

(3) Don't shoot into blasting caps, whether electric or other, with a rifle or pistol.

(4) Don't handle or store blasting caps in or near a residence.

(5) Don't allow blasting caps to be stored where children or irresponsible persons can get at them. Keep them under lock and key.

(6) Don't store or transport blasting caps of any kind with high explosives.

(7) Don't keep blasting caps, electric or other, in a damp place.

(8) Don't carry them in your pocket.

(9) Don't tap or otherwise investigate them.

(10) Don't try to pull the wires from an electric blasting cap. The wires should not be jerked or roughly handled.

(11) Don't attempt to take blasting caps from the box by inserting a wire nail or other sharp instrument.

(12) Don't allow priming (the placing of a blasting cap in dynamite) to be done in a thawing house.

(13) Don't fasten the blasting cap to the fuse with the teeth or with a knife. Use a cap crimper made for that special purpose.

(14) Don't handle electric blasting caps during the immediate approach or progress of a thunder storm.

(15) Don't attempt to use electric blasting caps with the regular insulation for extremely wet work. For that purpose, use waterproof fuses.

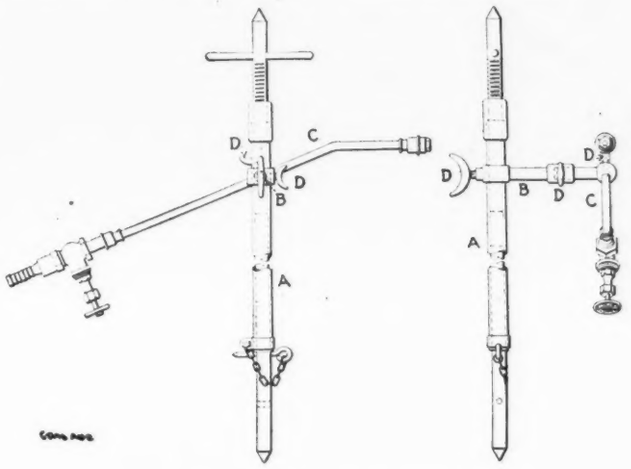
(16) Don't use old broken leading or connecting wire for electric blasting caps. A new supply will not cost much and will pay for itself many times over.

German Methods of Allaying Dust

Some notes on recent Prussian practice in allaying dust resulting from drilling boreholes are contained in "Zeitschrift für das Berg- Hütten- und Salinenwesen," Vol. 61, No. 1.

At the Richter shafts of the Laurahütte mine in the North Kattowitz district, a water jet is used to remove drill dust from holes bored in the rock by compressed-air hammer drills. Wrought-iron gas pipes about 0.4 in. in diameter and 4 ft. long are connected by hose with the water piping and introduced into the hole during the work of the drill so that the water continuously removes the drill dust.

At the Monopol mine in the Dortmund I mining district, a water-jet device has been used with excellent success to render stone dust of machine drills harmless. This is shown in Fig. 1. It comprises a mounting column 4, similar to a drill post, which extends from floor to roof in the middle of the roadway. Upon it, one or more movable brackets *B* are affixed, according to the number of holes to be drilled simultaneously. On the ends of these arms



Apparatus for Allaying Drill Dust

are carried sprinkling pipes *C*, which can be revolved and moved longitudinally. They have at the front brass or bronze nozzles, while the rear ends, which are provided with valves, are connected with the water-supply piping by rubber hose. The valve of each pipe is so adjusted that a fine stream of water flows from the nozzle. The jet of water is arranged to strike exactly in the drill hole and is clamped in this position by the winged screw *D*. Experience has shown that a water jet about 0.04 in. thick suffices to moisten the waste from a hole so as to prevent the formation of a cloud of dust. Since the workmen are not annoyed by so small a quantity of water and as the apparatus is easily and quickly manipulated, they are willing to use it.

To obtain a similar end an appliance is being used in the Schlägel und Eisen I-II mine in the East Recklinghausen mining district. This is patented by Herr Voss and called a "dust destroyer." It is manufactured by the Glückauf Drill Factory, in Gelsenkirchen, Germany. As shown in Fig. 2, the apparatus consists of the small tube *B* connected with the T-piece *A* and the collar *D* on the hammer drill. This little tube ends in a nozzle *C*. Per-

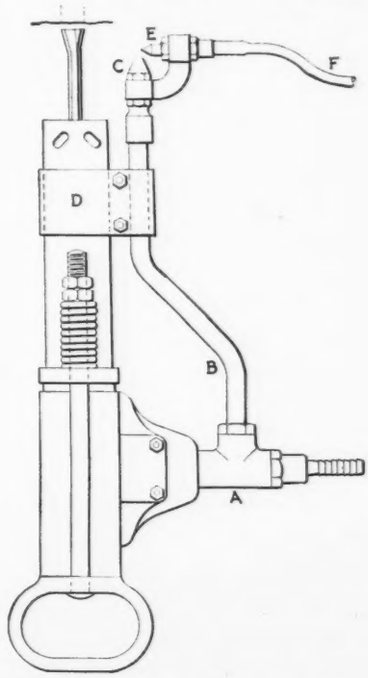


Fig. 2. Hammer Drill Fitted with a Water Jet

pendicular to this is another nozzle *E* connected with a hose *F*. When drilling, this is hung in a water tank.

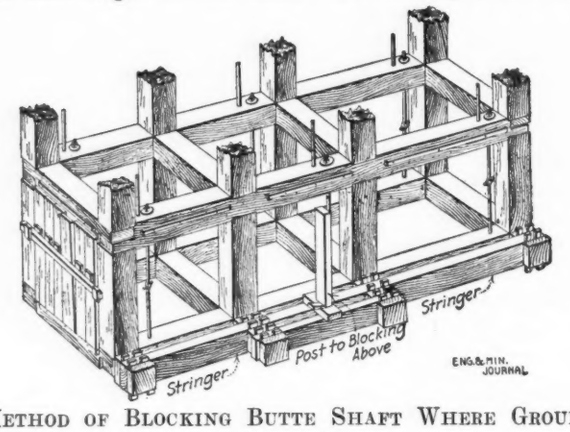
The T-piece *A* is connected with the compressed-air piping so that a part of the air flows through the little tube *B* and the nozzle *C* and sucks a supply of water through the nozzle *E* and the water hose *F*. This is finely sprayed around the drill hole thus continuously allaying the stone dust as it forms in drilling. Since the fixture is fast connected with the hand-hammer drill, the workmen are compelled to make use of it.

Use of the Photostat

We recently described a new apparatus, called the Photostat, for reproducing drawings, documents, etc. At the Alaska-Treadwell mines this instrument is used for a great variety of purposes. All progress maps, new work, etc., is laid out either in pencil or in ink and photostat copies are given to the underground foremen and shift bosses. The same thing is done with regard to stope maps, position of pillars, etc. The use of blueprints in the machine shop, foundry, and other construction departments has practically been discontinued, photostat copies having been substituted, with the exception where large scale drawings are required. In the office, all deeds, leases, etc., are copied as soon as they arrive and the photostat copy is sent to the San Francisco office for filing. This has the advantage of giving an exact copy of the original, with all changes, mistakes, etc., faithfully reproduced.

Shaft Blocking at Butte

When the ground breaks large in a Butte shaft the method of blocking shown in the accompanying illustration is employed. Blocks about 5 in. thick are placed back of the dividers and end plates and toe-nailed from above (A. I. M. E. Bulletin, August, 1913). A stringer is then nailed to these blocks parallel to the wall plates, the full length of the shaft. Alternating blocks and



METHOD OF BLOCKING BUTTE SHAFT WHERE GROUND BREAKS WIDE

stringers are nailed on until the space is completely filled. Wedging is then done between the blocks and stringers, the wedges being driven both from above and from below. In order to prevent the blocking being knocked out by blasting an upright post is set on a crosspiece over the blocking, as shown, and wedged to the blocking of the set above.

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Latch for Holding Car on Cage

The accompanying illustration shows the device for holding timber or other trucks on the cage, employed at the Kennedy mine of the Rogers Brown Ore Co. on the North Cuyuna range. It consists of a horizontal bar of

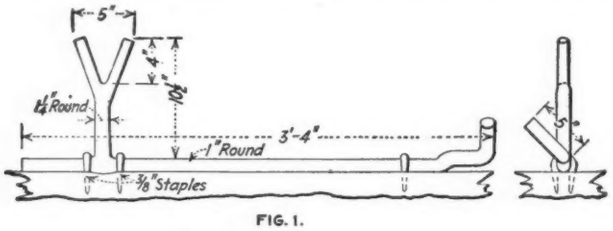

FIG. 1.

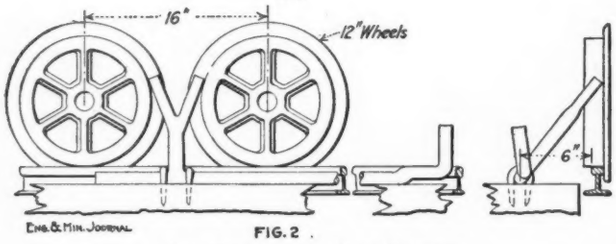

FIG. 2.

AN EFFICIENT CAR LATCH

round iron held loosely by staples to the wooden floor of the cage, so as to revolve freely but not to slide. Near one end a 1¼-in. round bar is welded to project at right angles and its end is split to form a fork 5 in. across the top. The other end of the horizontal bar is made eccentric for a few inches and then turned at right angles. The latch is placed so that the fork will be at about the center of the cage and the planes of the fork and of the bent end are so related that the operator can slip his foot under the latter when the fork is thrown back out of the way. The construction and dimensions are shown in Fig. 1, which, however, does not represent the latch in a normal position. In Fig. 2 the latch is shown engaging the wheels of a truck. The truck is run on the cage until the space between the wheels is about opposite the fork, when the operator throws the latch over and the fork falls on the treads of the wheels and against the flanges, at a point somewhat above their centers. The truck is thus held against movement in either direction.

The device is in use on a slow-moving cage in a shallow mine. It would seem that on a fast-moving cage, one, for instance, actuated by a first-action hoist, there would be danger that the fork might bound out as the result of a jolt and thus release the truck.

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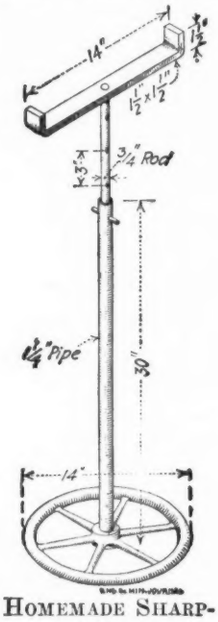
Stand for the Blacksmith Shop

A handy little device in use in the blacksmith shop of the Sterling Iron & Ry. Co. at Lakeville, N. Y., is shown herewith. It serves as a stand for resting the free end



HOMEMADE SHARPENING REST FOR LONG STEEL

of long drill steel in process of being sharpened or for other long work on the anvil. The supporting base is a discarded handwheel such as is used for rack-and-pinion chute gates or for car brakes. Into the square center hole is fastened a short piece of 1¼-in. pipe. In this is telescoped a piece of ¾-in. round iron; this is riveted through a horizontal piece of iron bar with its ends turned up, on which the work can rest. The height of this T-shaped standard can be adjusted in the pipe stand by means of a nail thrust through a hole in the pipe and one of several holes in the rod, spaced about 3 inches.

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The Use of Round Timber, Satisfactorily Framed, makes available a larger source of supply for timbering in the Butte mines, which has heretofore served no useful purpose, says G. E. Moulthrop in the November A. I. M. E. Bulletin. This promotes economical mining and also releases large timber for other commercial uses.

DETAILS OF METALLURGICAL PRACTICE

Steel-Tape Repairing in the Field

By Frank A. Glass*

An article in the Journal of Sept. 20 on "Tape Repair Outfit for Field Use," is of interest and the method is a decided improvement over riveting. Tin, shears, solder and candles, however, are not convenient to carry in one's hat band or vest pocket and the same applies to a riveting outfit. When a tape breaks, it is usually desirable to splice it at once, even though camp is but a few hundred yards away and a good road leads to it.

The "Eureka" tape repairer is a great time saver, and is satisfactory in every respect. It is a strip of tin about ¾ in. long with two of its edges bent over until they nearly meet. The inner faces are prepared with a coating of soft solder by the makers, and to use it, all that is necessary is to insert the cleaned ends of the broken tape, pound the overlapped edges of the tin, support the ends of the tape near the break firmly, and then hold a lighted match under the splice. When the match has burned out and the splice is cool enough to handle without discomfort, the job is finished.

The prepared splices can be ordered to fit any width of tape. They are made by the Chicago Steel Tape Co., and can be obtained through almost any dealer handling engineering supplies for a few cents a dozen. Two or three can be conveniently carried in the field in one's hat band or sewed in the lining of trousers or vest, and are as much a part of a field outfit as notebook or pencil.

Breakages of cross-hairs in a transit are not common in instruments fitted with finely drawn metallic cross-hairs, but the writer had a set made of spider webs that broke when he was far from headquarters. It was easy to find webs in an old building, but no glue, shellac, mucilage, pitch or corn-starch paste was available. Neither was a pair of dividers, the conventional tool of the textbook writers, at hand. As an emergency measure and as an experiment, the webs were fastened in place with the material next to the shell of an egg and the fingers were used to obtain the desired tension. The transit was then given six weeks of hard service and when it was sent to the factory for metallic cross-wires and other repairs, the spider-webs were in good shape. This method is not recommended for general adoption, and is described merely to show one of the ways in which tedious and costly delays may sometimes be avoided.

[While not so good as Mr. Glass' suggestion, some strips of tin and the new soldering pastes now gotten out for home use also suggest themselves. These need no soldering iron, and no separate flux is required.—Editor.]

*Mining engineer, Citizens State Bank Building, Brainerd, Minn.

Battery-Sand-Treatment Plant

The usual battery-sand-treatment plant, found in the gold mines of the Rand, consists of a tube mill, shaking amalgamating plates, treatment vats, sludge and solution pumps. As the quantity of sand treated is small, the tube mill need not be large, the usual size being 4 ft. in diameter by 6 ft. in length, the construction being similar to that of the full-size tube mill used in the crushing plant. The shaking plates, states C. O. Schmitt, in "A Textbook of Rand Metallurgical Practice," Vol. 2, need not be larger than 6 ft. by 2 or 3 ft. The battery sand is crushed in the tube mill to a considerable fineness, and, after passing over one or more shaking plates where the free gold is extracted, is either treated in a miniature slime plant of the decantation type or in a plant using air-lift vats, as shown in Fig. 1. In the former case, the plant contains two vats, both of which can be used for collecting or treating purposes. The treatment is similar to that given to slime in a decantation plant, excepting that, owing to the greater value of the material handled, the time allowed for treatment is considerably greater. The gold-bearing solution obtained in the plant is either precipitated in a small extractor provided for the purpose, or is sent to the main precipitation plant. The residue may be sent direct to the dump, but generally it is preferred to send it to the slime plant for further treatment.

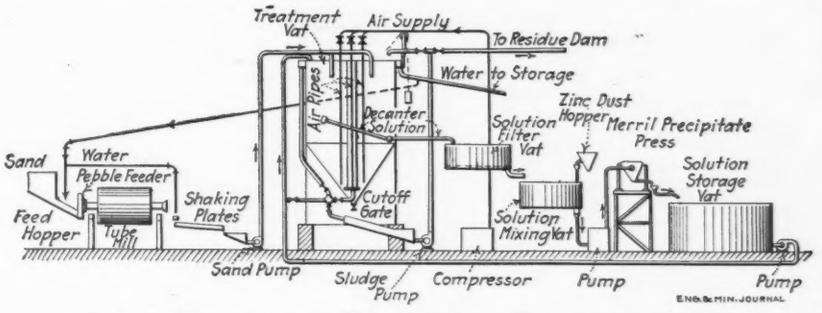


Fig. 1. Elevation of Battery-Sand-Treatment Plant

In the plant using the air-lift vats of the type shown in Fig. 2, the crushed sand is collected in one vat, and after the water is decanted off, the collected charge is transferred with solution to a treatment vat, where it is chiefly treated by aëration in conjunction with cyanide solution. The plant shown in Fig. 1 differs from the usual plant, inasmuch as the gold-bearing solution is precipitated in a Merrill press with the aid of zinc dust.

The Crosse battery-sand-treatment plant, which is illustrated in Fig. 3, consists of a grinding mill, conical treatment vat, settling vat, solution-filter vat, extractor box and solution-storage vat. The grinder consists of an outside cylinder which turns at the rate of 10 r.p.m. There is an inside revolving cylinder which rests on the outside cylinder, revolving at the same rate, and the inside cylinder is worked to and fro during the revolution by the toggle arrangement shown. This combined motion

provides the action required to reduce the pyritic portion to a fine state of division. The particles of mineral having been sufficiently finely ground are carried away by the stream of cyanide solution running through the mill.

The method of treatment is as follows: The conical treatment vat is filled with cyanide solution from one of the storage tanks by using the air-lift pump nearest the storage tank. The mill is then started and the overflow from the conical vat is allowed to run into the hopper, and the battery sand is fed in slowly. The air-lift pump

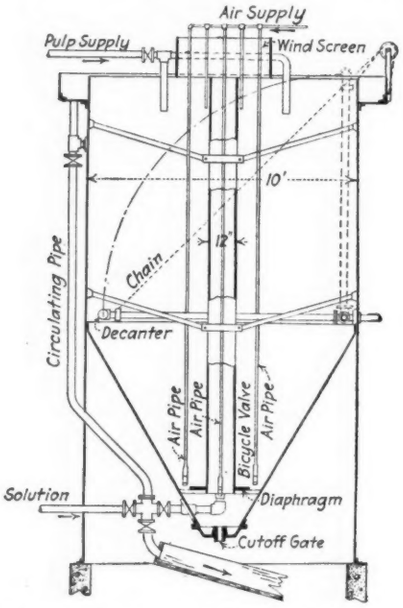


FIG. 2. SECTION OF AIR-LIFT VAT

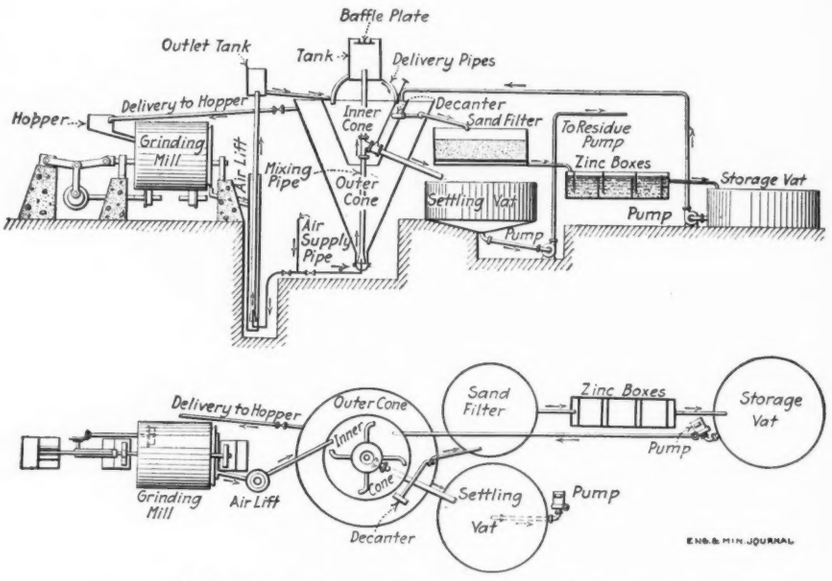


FIG. 3. CROSSE PLANT FOR TREATMENT OF BATTERY SANDS

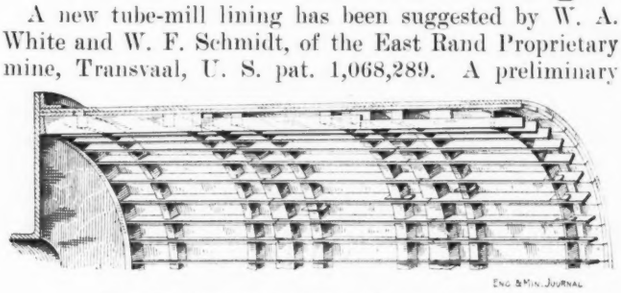
connected with the grinding mill is started, and also the agitation in the conical vat. The finely ground material is being continually run into the inner cone of the conical vat, and the overflow returns to the hopper, washing in more sand. Enough lime must be added, from time to time, to keep the solution alkaline; cyanide can also be added if required.

If the conical vat is constructed to treat two tons of finely ground sand, as soon as this amount has been fed in, as described, the last trace of sand is washed into the cone, and then, if any amalgam was left in the mill, it can be recovered by unscrewing a plug and lifting the inside muller by suitable means and washing out the amalgam into a bucket. Having charged the conical or treatment vat, the solution now contains a large proportion of the gold contents of the sand. The decanter connecting the overflow pipe and the sand filter are lowered into the fairly clear solution on the surface of the outside division of the cone. This solution, after passing the sand filter, is run into the zinc box; the gold having been deposited, the solution is then returned to the storage vat by the air-lift pump, as stated. About 25% of the contents of the conical vat is drawn off per hour, so that in four hours a volume equal to the contents of the vat has been removed and replaced by fresh solution from the storage vat; for every volume of solution equal to the contents of the treatment vat, 75% of the dissolved gold has been removed so that eight hours' circulation would remove 93¾% of the dissolved gold.

This extraction is quite enough in the treatment of most battery sands, as 85% of the remaining soluble gold would be obtained from the decanted solution, and this solution need not be passed through the zinc box, as it could be used for the next treatment. The pulp should not be allowed to settle in the conical treatment vat. To prevent this the pulp is discharged into the conical-bottom settling vat, where the solution is decanted off and the residue discharged to the residue dam or to the slime plant for further treatment. If it is inconvenient to discharge at the bottom of the treatment vat, a suitable method has been arranged by taking off the concentrated underflow through a pipe connected with the air-lift pipe inside the cone. This discharge pipe is connected at a point half way up the air-lift pipe, and by opening a cock, all the fine sand can be pumped into the settling vat at a more convenient height than discharging at the bottom.

White-Schmidt Tube-Mill Lining

A new tube-mill lining has been suggested by W. A. White and W. F. Schmidt, of the East Rand Proprietary mine, Transvaal, U. S. pat. 1,068,289. A preliminary



WHITE-SCHMIDT TUBE-MILL LINING

shell of steel is laid, composed of thin, narrow bars laid edge-to-edge and cemented together. Upon this lining are placed blocks for receiving the rest of the lining. This, as shown in the illustration, is composed of thin, wide bars of steel, set in chocks and arranged radially. Between the bars is formed a trough into which pebbles are supposed to pack and form a lining essentially like the El Oro lining. The bars may be set away from the shell by resting them on the chocks, the advantage of the system being that the bars may be practically entirely worn out before renewal is necessary.

COMPANY REPORTS

International Nickel

The annual report of the International Nickel Co., 43 Exchange Place, New York, for the year ended Mar. 31, 1913, states that during the year the entire outstanding bonded indebtedness of the company was retired. The company offered to the bondholders to pay its bonds at the redemption price, $110 and interest, and all bonds that were not tendered in response to this offer were called for payment on Apr. 1, 1913. The improved conditions in the steel industry resulted in a greatly increased demand for nickel from steel makers, and in all other industries where the company's products are used the demand is said to have been the best in the history of the company. Practically nothing can be gleaned from the report about the affairs of the concern other than shown by bare financial statements. It is stated that the profits are computed on sales actually made to customers and that all inventories are taken at cost. The profit and loss statement shows that the profits for the year amounted to $5,020,304.92 and was obtained as follows: Earnings of all properties after deducting manufacturing and selling expense and ordinary repairs and maintenance, $6,802,886.22; other income, $126,220.73; total income, $6,929,106.95. Administration and head office expenses including general office expense, traveling, legal and office rent, salaries and commissions, $389,956.37; expenses of consolidation, $87,906.07; corporation and capital stock taxes, $64,445.43; total, $542,307.87. This leaves a net income of $6,386,799.08, from which $1,366,494.16 is deducted to provide for the following items: depreciation of plants, $553,449.37; mineral exhaustion, $498,471.50; bond sinking fund, $89,458.34; and interest on bonded debt, $255,114.95, leaving the balance for profit as stated. The consolidated general balance sheet shows that $1,323,276.31 was spent for new construction, equipment and additional property, there was also a deferred expenditure of $255,033.29 chargeable to operations for development and diamond drilling on properties. The current assets amounted to $9,331,200.88 and current liabilities, $2,135,594.54. A balance of $994,501.33 was carried forward for the year after providing for $534,754.70, dividends on preferred stock and $3,491,048.89 on common stock.

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Esperanza Ltd.

The Esperanza Mining Co., El Oro, Mexico, according to a statement issued from its New York office, made a profit of $30,640 during July, 1913. The mill ran 28 days and crushed 7727 dry tons of ore. Tailings treated amounted to 13,071 tons, concentrates shipped to smelter, 320 tons. All receipts amounted to $110,168, made up as follows: Bullion produced, $70,020; concentrates produced, $39,845; rents and other sources, $303. The value of products are estimated. All expenses amounted to $79,528 and consisted of: $70,020 for working expenses, including development, marketing of bullion, and freight and treatment charges on concentrates shipped to smelter; $263 for New York office expense and $996 for London office. Development work performed totaled 1279 ft. The manager cables that on the San Carlos vein the various drifts have been advanced 368 ft., the average width being 6¼ ft., assaying 0.5 oz. gold per metric ton, also that 85 ft. has been advanced in the raises, the average width being 4¾ ft., assaying 1.75 oz. gold per metric ton.

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Oriental Consolidated

The report of the Oriental Consolidated Mining Co., in the Unsan district of Chosen (Korea), Empire of Japan, for the year ended June 30, 1913, gives as total receipts in United States currency, $1,661,476; operating costs, $1,016,778; construction and development work, $73,314; leaving net receipts of $571,384. Dividends of $429,390 were paid.

The production of the different mines of the company was as follows: Tabowie, 112,529 tons, valued at $7.18 per ton; Taracol, 93,558, valued at $6.03; Chintui, 28,487, valued at $4.18; Kuk San Dong North, 12,757, valued at $3.92; Kuk San Dong South, 13,774, valued at $2.72; Kuk San Dong Central, 606, valued $4.20; Kuk San Dong Kisen, 6986, valued at $3.63; Charabowie, 37,658, valued at $8.65, and Candlestick, 6463, valued at $10.61. Besides this, tribute mines produced 883 tons, valued at $5.30. The total production of the company was therefore 313,701 tons with an average value of $6.39 per ton and a total value of $2,005,463. There was obtained as bullion $988,715, or $3.15 per ton, and as concentrate, $804,836, or $2.56 per ton. The net yield from concentrate was $640,609, or $2.04 per ton, giving a total net yield of $1,629,324, or $5.18 per ton, a net saving of 81.3%. The mill tails ran $0.68 per ton.

Mining costs for the year were $610,212, or $1.95 per ton; milling costs were $168,657, or $0.54 per ton; cost of transportation was $3602, or $0.01 per ton; concentrate expense was $107,392, or $0.34 per ton mined; general expenses were $126,915, or $0.406 per ton; net development expenses were $4612; construction expenses were $68,702.

Development work in the active mines amounted to 727 ft. of shaft work, 8434 ft. of main drifts, 9364 ft. of subdrifts, 5796 ft. of crosscuts, 8927 ft. of raises and winzes, a total of 33,248 ft. The cost of this work is included in the cost of mining. The cost of the development given as a separate item in the expenses covers 1534 ft. of prospecting work outside the active mines.

Ore reserves are for the Tabowie mine, 470,000 tons containing $2,850,000; for the Taracol, 260,000 tons containing $1,185,000; for the Chintui, 17,400 tons containing $67,875; for the Kuk San Dong, 16,200 tons containing $47,825; for the Charabowie, 38,600 tons containin $301,000; for the East Candlestick, 3700 tons containing $37,000, giving a total reserve of 805,900 tons containing $4,488,800.

Prospecting work was done on the West Candlestick, and some ore found. The Chosan district claims received some attention, but nothing of value was found. The Tong Koll was worked to some extent, but will be more actively handled when machinery is available. On other prospects, some 225 ft. of work was done, but nothing of value was found. The Chittabulbie mine was turned over to Koreans to work on a royalty basis.

The Taracol tube-mill plant treated 25,319 tons of concentrate during the year and yielded $675,656, an extraction of 84.7%. The plant, however, so far is a failure economically, because the extra cost of treatment amounts to more than the gain in extraction. It is hoped to improve the operation of this plant in another year. The Kuk San Dong cyanide plant treated 4826 tons of ore and yielded $98,295, an extraction of 65%. The Kuk San Dong dump retreatment plant handled 17,267 tons of ore and yielded $100,856, an extraction of 70%. The Candlestick cyanide plant treated 6511 tons of ore and yielded $19,416, an extraction of 52.9%.

An interesting item of expense for the year was $975 for a new burglar-proof door on the Tabowie vault. Electrification of the Maibong, Taracol and Tabowie camps is practically completed. The total expenditure is $62,304. The "Wood company" during the year furnished 27,287 cords of wood, 159,697 mining timbers, 57,539 pieces of lumber, and 5644 boxes of charcoal for the Tabowie and Taracol camps. On the advice of the Governor General of Chosen, the company has commenced tree planting, with the assistance of Kosaburo Matsushita, a forestry expert; 30,000 acacia trees were planted and nurseries established for 120,000 seedlings. This work required an expenditure of $2628. The electric water-power plant ran 252 days and was shut down 113 days on account of the lack of water. The company's schooner "Dorothy" was wrecked on the west coast in March and was a total loss. A new schooner to replace her was bought for $500. The medical staff treated 29,345 cases at the Taracol hospital during the year, of which only 13,448 were company employees. No charge is made for hospital treatment, and people come for considerable distance to receive its benefits. The department cost $8868. On Christmas day the management distributed $10,000 among the foreign employees on a percentage basis, the older employees receiving the greater benefit.

It is noted that the ore crushed was less than during the previous year, owing to the shortage of labor, the lack of water during the winter at Tabowie and the fact that only 20 stamps out of 40 ran at Kuk San Dong. The total gross receipts were the largest in the history of the concession, due to improved sorting and a better grade of ore in the lower levels of the Tabowie and Charabowie mines. Total expenses were higher, due chiefly to the larger amount of development work, heavy construction expenses, the Charabowie mine flood and the increased cost of concentrate treatment. Development was good at the Tabowie and Charabowie mines, fairly satisfactory at the Taracol and Chintui and poor at the Kuk San Dong and Candlestick. The ore reserve is the highest now of any time since 1906. During the coming year it is hoped to decrease operating expenses by using a smaller amount of mining timber, introducing electric power and reducing construction expense. The total production of the company to date is 3,236,216 tons valued at $19,858,339. Dividends of $4,932,910 have been paid.

Wallaroo & Moonta

The 1912 report of the Wallaroo & Moonta Mining & Smelting Co., Adelaide, South Australia, shows that the company made a profit of $390,927 during the year from which it paid a dividend of $291,600. The expenses were made up of $1,843,616, or $10.10 per ton mined for operations at mines and smelter and $104,478, or 57c. per ton mined for office expenses, royalties, taxes, depreciation, etc.; making a total of $10.67 per ton mined. Wages and underground contracts constituted about 60% of the working expenses. The total tonnage handled at both mines amounted to 182,729 tons of crude vein stuff, averaging 3.813% copper. The smelting works treated 65,920 tons of dressed ore, matte and precipitates from which 6287 tons of refined copper, 102 tons of bluestone, 1757 oz. of gold and 2045 oz. of silver were produced. Owing to the recent fire at the Mount Lyell mine attention was called to precautions taken at the Wallaroo mines for the prevention of fire. Water connections for allaying dust as well as connections to water columns in the shaft are available for fire fighting. In the electric-pump chambers all exposed parts of wood are overlaid with noninflammable material, a protective wash is also used on other exposed woodwork in other parts of the mine. A small flotation plant was in operation during the year resulting in the saving of an extra 100 tons of copper which otherwise would have remained in the tailings. A second and larger unit to the flotation plant was under construction at the end of the year.

MATERIAL HANDLED OR PRODUCED PER MAN PER YEAR

	Tons of veinstuff at mines		Tons of Charge at Smeltery	Lb. of fine Copper for all Men
	Wallaroo	Moonta		
Miners	380	352	.....	20,000
Smelters	.....	.....	825	139,000
Mechanics and skilled workmen	765	2,170	2,190	5[illegible],500
Engine-drivers and stokers	3,760	990	5,550	160,000
General surface labor	650	376	1,240	36,600
General underground labor	1,900	2,940	.....	166,500
Flux quarries	.....	.....	4,620	782,000
Youths and boys	2,690	8,160	2,190	140,000
Assistants and petty officers	13,600	4,080	7,550	4,700,000
Officers	37,600	10,900	20,800	1,280,000
Adelaide office staff	.....	.....	.....	2,350,000
Total	149	128	2[illegible]5	9,000

A sliding scale of wages is now in force and the following bonuses are paid to boring-machine and other contract miners; when copper is over 11.91@12.99c., 61c. per week; 12.99@14.07c., $1.22; 14.07@17.32c., $1.82; 17.43@20.57c., $2.43; and over 20.57c. per lb., a bonus of $3.05 per week is to be paid. For other employees on standard wages the advance is from 5 to 25%, increasing 5% in the order named for contractors. The cost of producing a long ton of refined copper and placing it f.o.b. ocean steamer was as follows: Mining, including repairs and maintenance, $211.17 per long ton; smelting, including repairs and maintenance, $59.69; shipping charges, $3.73, and Adelaide office expenses, $2.15; total, $276.74 per long ton of refined copper. The following table of labor is based on the number of men employed at Dec. 31, 1912. For comparison it may be stated that in 1911 the average computed in the same way was 9750 lb. of refined copper per man employed, secured from 153,129 tons of ore averaging 4.292% copper by wet assay.

Laying Out Cananea Underground Curves

By A. Carr Harris*

SYNOPSIS—Details of a method by which a mine foreman can run his curves with a minimum of work by the surveyor. A set of curve tables is given for this work.

In drifting and crosscutting where mechanical haulage is in use, careful attention must be paid to maintaining negotiable curves when connections are made. A simple and effective method is used by the engineers of the Cananea Consolidated Copper Co. At this property there have often been curves of different radius run from time to time and also, at times, as many as four or five curves under way at once. To give daily centers of these curves would entail a great deal of transit work. The method adopted leaves the curve in the hands of the foreman for several rounds at a time and has proved entirely satisfactory. A mine curve at Cananea requires practically no more delay in getting the center each day than is required in taking centers for a straight line drift.

To start a curve from a hard-rock drift, the transit man sets his plug as close to the breast as possible, so that in using his plug as the B.C. (beginning of curve), it will not be necessary to shoot any rock from the side of the drift. He has the foreman put in a good horizontal stull across the drift from 4 to 7 ft. behind his plug, and as high up in the drift as possible. A 4x6-in. stull is usually large enough, but it should be wedged in tightly with dry wedges so that the blasting will not dislodge it. The transitman sets up under his B.C. and turns off from his backsight down the line of drift deflection angles corresponding to centers on curve at distances of every 5 ft. measured from the B.C. plug. For each deflection, he lines in a nail on the stull behind him, the nail being driven partly in by his assistant. He then has a row of nails in the stull, and these nails lined up with the B.C. plug taken in order, will give center on curve at distances of 5, 10, 15, 20 ft., etc., measured from the plug. For curves of 40 ft. radius, he usually would set six or seven nails and for 100 ft. radius curves about eight or 10 nails, depending on how wide the drift is to be carried. To get the center of breast at any time, the distance is measured roughly from plug to breast, then, counting the nails on the stull from the beginning, the line string is placed on the stull which comes nearest to representing the distance measured. This nail lined up with the B.C. plug, gives the breast center.

This method of taking centers does not require any technical skill and does not require the attention of the transitman again until all the nails he has set are used up; this means an advance in the drift of from 20 ft. to 50 ft., depending on the radius and the width of the drift, before the transit is again required. Fig. 1 exhibits the method for a long curve.

For a timbered drift, much the same idea is carried out. Preferably, although not necessarily so, the curve is made to start from the particular set of timbers upon which the B.C. spad is set by the transitman in the center of the cap. A deflection angle is turned for each succeeding set of timber which is to be placed on the curve and a corresponding line nail driven into the cap preceding the one upon which the transit spad has been placed. The center of each set of timbers to be placed on the curve will be lined in with the B.C. spad and the proper nail of the cap behind. To avoid misunderstanding between the transitmen and foremen and shift bosses, the practice has been for the transitman always to make the first-line nail he sets correspond to the first set of timbers ahead of his transit spad.

The regular length of collar brace is put in on the outside of curve, the posts on this side standing 5 ft. center to center. The length of collar brace on the inside of curve is computed for the given cap length and radius, and given to the foreman who passes the measurement along to his timbermen. This collar brace

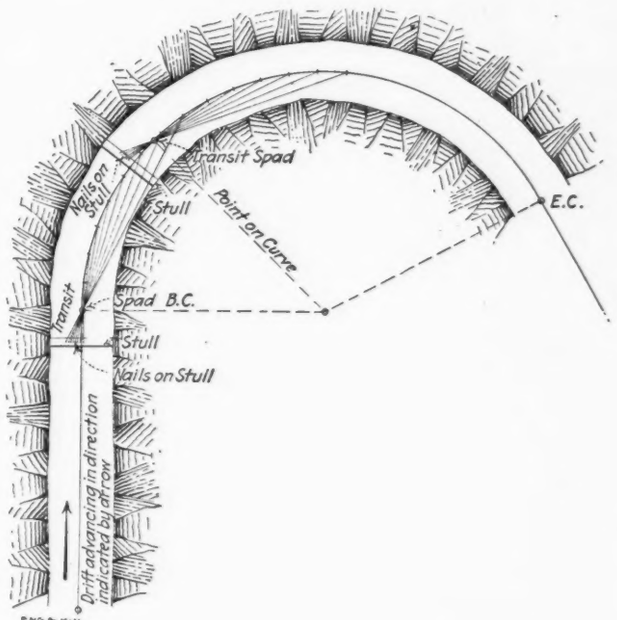


Fig. 1. General View of Curve

measurement is the only one out of the ordinary which the timberman has to consider, and it is the same for all sets on the curve excepting at the end of the curve, which usually falls between two sets of timber and not on a cap. For this case, a special collar brace is computed to go in with the set which falls beyond the end of curve and a special line nail is set for the particular set. This set is a little more complicated for the transitman to figure, but the timbermen have no more trouble than simply to put in the special length of brace. When this last set is placed, the transitman gets around and gives them line for the straightaway, and thereafter they set the regular collar braces on both sides of the drift. Fig. 2 shows isometrically a typical timbered curve.

Having had a number of these curves to figure and often with different sizes of timbers and different lengths of caps, I decided in 1911 to make up tables with different set dimensions and different radii. These tables, herewith presented, have proved trouble-and-time-savers,

*Mining engineer, 445 Piccadilly St., London, Ont., Canada.

CURVE TABLES

25-Ft. Radius

Chord Ft.	Deflection	Caps Ft.	Caps In.	For Timbering Outside Ft.	For Timbering Inside Ft.	For Timbering Center Ft.	Deflection	Chord Deflection Ft.
5	5° 44½′	3	8	5	4.317	4.658	5° 20½′	0.899
10	11° 32¼′	4	0	5	4.259	4.630	5° 18⅜′	0.888
15	17° 27½′	5	0	5	4.09	4.54	5° 13′	0.855
20	23° 34¼′	5	8	5	3.981	4.4905	5° 09¼′	0.834

30-Ft. Radius

5	4° 46⅜′	3	8	5	4.424	4.712	4° 30½′	0.759
10	9° 35⅞′	4	0	5	4.375	4.6375	4° 28⅜′	0.750
15	14° 28¾′	5	0	5	4.231	4.615	4° 24⅛′	0.727
20	19° 28¼′	5	8	5	4.137	4.5685	4° 22′	0.712
25	24° 37½′							

35-Ft. Radius

5	4° 05⅞′	3	8	5	4.502	4.751	3° 53½′	0.657
10	8° 12¼′	4	0	5	4.460	4.729	3° 52½′	0.651
15	12° 22½′	5	0	5	4.333	4.666	3° 49¼′	0.633
20	16° 36′	5	8	5	4.251	4.625	3° 47¼′	0.622
25	20° 55½′							
30	25° 22¾′							

40-Ft. Radius

5	3° 35′	3	8	5	4.562	4.781	3° 25½′	0.580
10	7° 10⅜′	4	0	5	4.524	4.762	3° 24⅜′	0.575
15	10° 48½′	5	0	5	4.411	4.7055	3° 22¼′	0.561
20	14° 28¾′	5	8	5	4.339	4.6695	3° 20⅝′	0.553
25	18° 12½′							
30	22° 01⅛′							
35	25° 56¾′							

45-Ft. Radius

5	3° 11′	3	8	5	4.609	4.8045	3° 03½′	0.519
10	6° 22¼′	4	0	5	4.574	4.787	3° 03′	0.515
15	9° 35⅝′	5	0	5	4.474	4.737	3° 01′	0.504
20	12° 50½′	5	8	5	4.408	4.704	2° 59¾′	0.497
25	16° 07⅓′							
30	19° 28¼′							
35	22° 53⅛′							
40	26° 23¼′							
45	30° 00′							

50-Ft. Radius

5	2° 52′	3	8	5	4.646	4.823	2° 45⅞′	0.470
10	5° 44½′	4	0	5	4.6154	4.808	2° 45⅜′	0.467
15	8° 37½′	5	0	5	4.524	4.762	2° 43⅔′	0.458
20	11° 32¼′	5	8	5	4.463	4.732	2° 42¾′	0.452
25	14° 28¾′							
30	17° 27½′							
35	20° 29¼′							
40	23° 34¾′							

60-Ft. Radius

5	2° 23¼′	3	8	5	4.7035	4.8517	2° 19′	0.395
10	4° 46½′	4	0	5	4.677	4.839	2° 18⅔′	0.393
15	7° 10⅞′	5	0	5	4.600	4.800	2° 17⅞′	0.386
20	9° 35⅞′	5	8	5	4.549	4.7745	2° 16⅞′	0.383
25	12° 01⅓′							
30	14° 28¾′							
35	16° 57⅓′							
40	19° 28¼′							
45	22° 01⅓′							

80-Ft. Radius

5	1° 47⅞′	3	8	5	4.776	4.888	1° 45′	0.299
10	3° 35′	4	0	5	4.756	4.878	1° 44⅔′	0.298
15	5° 22¼′	5	0	5	4.69	4.848	1° 44¼′	0.295
20	7° 10⅜′	5	8	5	4.658	4.829	1° 43¾′	0.292
25	8° 59¼′							
30	10° 48½′							
35	12° 38⅛′							
40	14° 28¾′							
45	16° 20′							
50	18° 12½′							

100-Ft. Radius

5	1° 26′	3	8	5	4.819	4.9995	1° 24½′	0.241
10	2° 52′	4	0	5	4.803	4.9015	1° 24¼′	0.241
15	4° 18′	5	0	5	4.756	4.878	1° 23⅔′	0.238
20	5° 44½′	5	8	5	4.724	4.862	1° 23⅓′	0.237
25	7° 10⅞′							
30	8° 37½′							
35	10° 04⅛′							
40	11° 32¼′							
45	13° 00⅛′							
50	14° 28¾′							
55	15° 57⅞′							
60	17° 27½′							

105-Ft. Radius

5	1° 21½′	3	8	5	4.828	4.914	1° 20½′	0.231
10	2° 43½′	4	0	5	4.813	4.907	1° 20¼′	0.230
15	4° 05⅞′	5	0	5	4.767	4.884	1° 20′	0.228
20	5° 28′	5	8	5	4.737	4.869	1° 19¾′	0.226
25	6° 50¼′							
30	8° 12½′							
35	9° 35⅓′							
40	10° 58⅞′							
45	12° 22½′							
50	13° 46¼′							

150-Ft. Radius

10	1° 54⅓′	3	8	5	4.879	4.9395	0° 56½′	0.163
20	3° 49¼′	4	0	5	4.868	4.934	0° 56⅓′	0.162
30	5° 44½′	5	0	5	4.836	4.918	0° 56⅔′	0.161
40	7° 39⅔′	5	8	5	4.814	4.907	0° 56¼′	0.161
50	9° 35⅓′							
60	11° 32¼′							

200-Ft. Radius

10	1° 26′	3	8	5	4.909	4.9545	0° 42½′	0.123
20	2° 52′	4	0	5	4.900	4.950	0° 42½′	0.123
30	4° 18′	5	0	5	4.876	4.938	0° 42½′	0.122
40	5° 44½′	5	8	5	4.860	4.930	0° 42⅝′	0.122
50	7° 10⅔′							

300-Ft. Radius Chord	300-Ft. Radius Deflection	400-Ft. Radius Chord	400-Ft. Radius Deflection	500-Ft. Radius Chord	500-Ft. Radius Deflection
10	0° 57¼′	10	0° 43′	10	0° 34½′
20	1° 54⅓′	20	1° 26′	20	1° 08⅔′
30	2° 52′	30	2° 09′	30	1° 43⅓′
40	3° 49¼′	40	2° 52′	40	2° 17⅔′
50	4° 46¾′	50	3° 35′	50	2° 52′

and may be used to advantage also in running in small curves on the surface for motor lines.

The first two columns of the tables give the deflection angles for a number of chords of various lengths and are to be used for a curve without timber. Where timber is set, the term "cap" represents lengths of caps measured from shoulder to shoulder; "outside," the distance from center of one cap to center of the next cap, measured at the shoulders, on the outside of curve; "inside," the distance from center of one cap to center of the next cap, measured at the shoulders, on the inside of curve; "center," the distance from center of one cap to center of the next cap, measured on the center line of curve as a chord; "deflection," the deflection angle to be turned for each set of timbers (Sin of defl. angle $= \frac{1}{2}\frac{\text{center dist.}}{\text{radius}}$); "chord deflection," the distance measured along center line of a cap, i.e., radius of curve, from center of cap to intersection with line of centers of the two preceding caps.

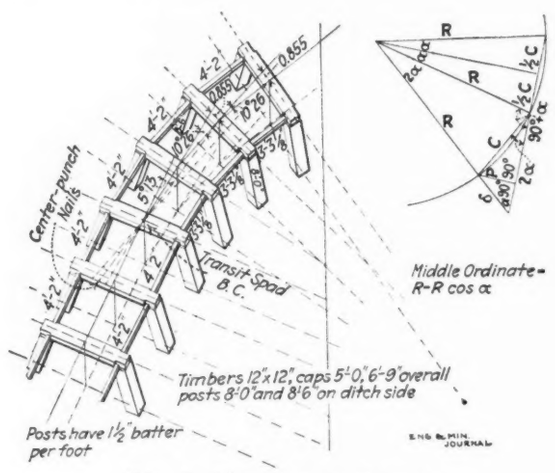


FIG. 2. TIMBERS ON CURVE
FIG. 3. IDEAL DIAGRAM OF CURVE

Referring to Fig. 3, calculations are made as follows for curves of small radius: .

For any chord C in a curve of radius R, where

a = Defl. Angle;
C = Chord;
R = Radius;

$$C = 2\,R\,Sin\,a$$

To find chord deflection δ measured along radius of curve:

$$a = 180° - (90° + 3\,a) = 90° - 3\,a$$

$$P = C\,Sin\,2\,a$$

$$\delta = \frac{P}{sin\,a} = \frac{C\,sin\,2\,a}{sin\,(90° - 3\,a)} = \frac{C\,sin\,2\,a}{cos\,3\,a}$$

These tables have been checked over by D. E. Curry and J. J. Hasbrouck of the Cananea company, to whom I am much indebted.

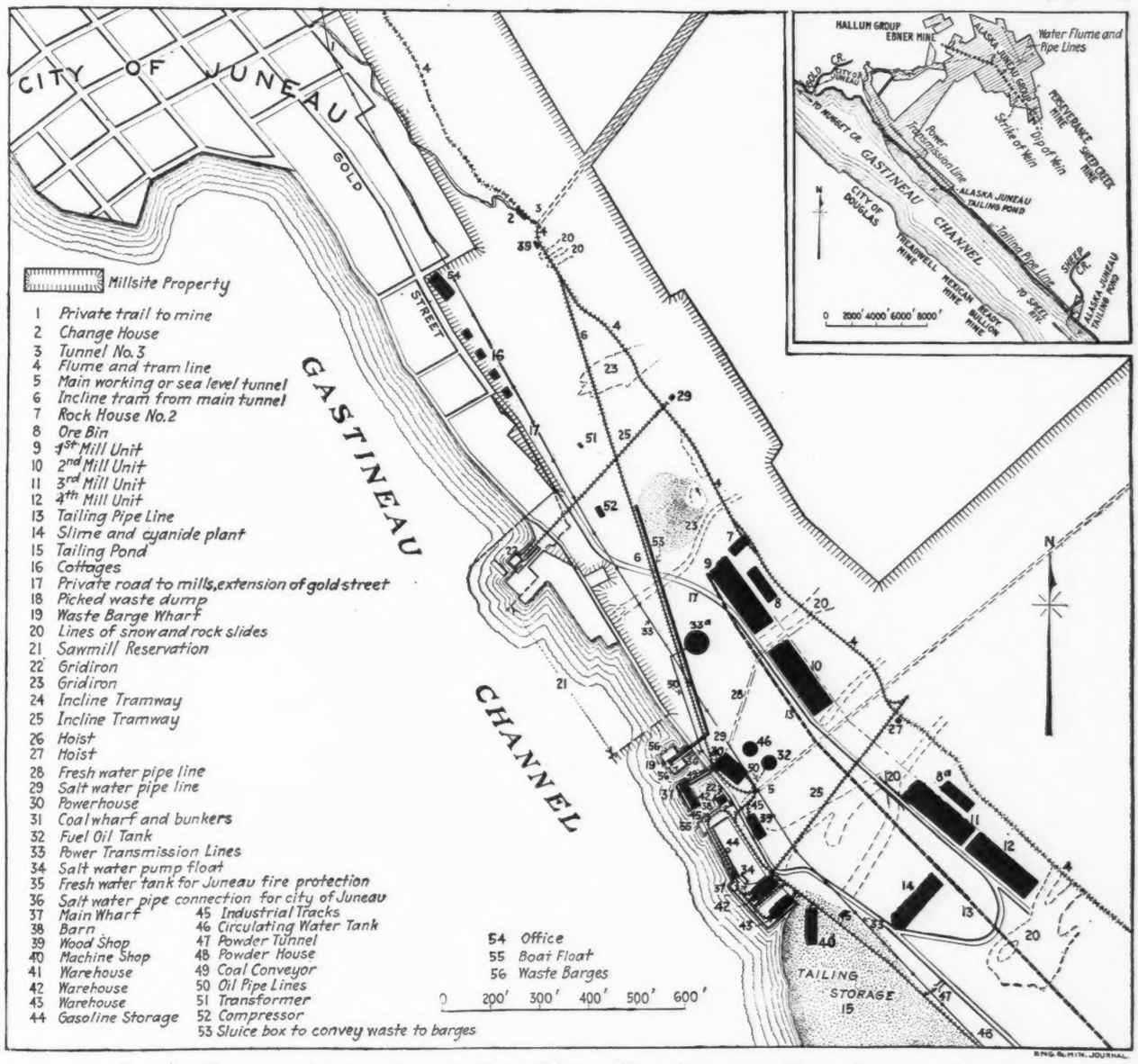
The Rheinisch-Westfälischen Cement Syndikat in Germany, which had its headquarters at Bochum, seems to have gone to pieces, several of the more important works having refused to extend the agreement through 1914. An attempt has been made to unite 14 of the Westphalian makers in a new local syndicate, but at the first meeting no agreement was reached as to prices or the regulation of production. The break has been followed by extremely low prices, bids having been made for a large contract at Hanover as low as 16c. per 100 kilos., or less than half the recent price made by the syndicate.

Developing the Alaska Juneau Mine

The accompanying illustration shows two plats, one an outline of the present property of the Alaska Juneau Gold Mining Co., together with the position of its water rights, flume lines, transmission lines, etc.; the second shows more in detail the proposed position of buildings and improvements constituting the milling plant which is just southeast of the town of Juneau. A part of the improvements shown have been completed, namely, the wharves, floats, warehouses, rock houses, etc., and practically all of the other work is now under way.

In a general way the scheme of mining is as follows: In the summer it is intended to work the openpits in Silver Bow Basin about four miles by wagon road from Juneau. The ore will there be crushed and passed through a raise 800 ft. long to the end of an adit driven from Gold Creek through the mountain a distance of about 6700 ft. From this point the ore will be transported by an electric haulage through a series of tunnels and trams to a point just southeast of the town of Juneau, where the milling plants are located. In the winter, the ore will be mined underground and transported in a similar way to that mentioned above.

At the present time, the main or Gold Creek tunnel has been completed and the raise is now being put up to Silver Bow Basin. The stations, and ore chutes at the foot of the raise have been completed. The entire tramways, including tunnels, flumes, track, etc., have been completed. The rock house at the milling plant has been completed and the grading for the first unit of 40 stamps is now well under way and should be completed the early part of next year. The positions of Perseverance and Sheep Creek mines of Alaska Gastineau property are shown in smaller map and also the Ebner mine of the U. S. Smelting, Refining & Mining Co.



GROUND PLAN OF ALASKA JUNEAU GOLD MILLS, NOW BUILDING NEAR JUNEAU, ALASKA

One of the four mills is completed and will soon begin operations. The positions of the Perseverance and Sheep Creek properties of the Alaska Gastineau Co. (Alaska Gold Mines Co.) and that of the Ebner in which U. S. Smelting, Refining & Mining Co. lately became interested, as well as the older Treadwell mines on Douglas Island, are shown in the insert map.

Scandinavian Electric Zinc Smelting

SPECIAL CORRESPONDENCE

The report of the directors of the Hydraulic Power & Smelting Co., Ltd., with statement of accounts for the 14 months ended Aug. 31, 1913, was submitted to the ordinary general meeting of shareholders in London on Nov. 4.

The capital of the company is 1,000,000 shares of £1 each, all of which have been allotted. It is intended, subject to the approval of the shareholders, to make application to reduce the capital to £500,000, by reducing the nominal value of each share from £1 to 10s.

During the period under review the capacity of the zinc-refining works at Sundlokken (Sarpsborg) has been increased from 8000 to 10,000 tons per annum, and the contract for the sale of the entire production from these works has been extended for another year, viz., until the end of 1915, at terms enabling satisfactory profits to be made.

The erection and equipment of the new zinc-smelting works at Trollhättan have been proceeding as rapidly as possible, and at the present time, of the seventeen 1000-hp. furnaces and eight 500-hp. furnaces to be installed, 13 of the former and all of the latter are completed.

For various reasons none of the complex ores for which the works were designed has been available, and the furnaces have been running on the ordinary classes of roasted zinc ores which do not yet prove commercially profitable. Considerable progress is, however, being made and the results achieved for the month of August, 1913, were a great improvement on any previous month's working. It has been decided temporarily to discontinue operations at the old works, and to concentrate all efforts to bringing the company's smelting process in the new works to a profit-earning stage. This scheme will render available a certain amount of surplus energy which the directors propose to utilize in other channels of manufacture already demonstrated as commercially profitable.

In June it became necessary to arrange for the provision of further money for the financing of the zinc smelting, and a scheme for this purpose was thereupon prepared, and approved by the debenture holders.

The scheme provided for the sale of the company's water-power interests in Norway to a new company for a consideration of £1,016,250, made up as to £180,000 in cash, £437,500 in debentures bearing interest from Mar. 31, 1913, and £398,750 in fully-paid shares of 10s. each, and an agreement was accordingly entered into with the new company on July 22. The £437,500 debentures have, since the date of the accounts submitted, been distributed in reduction of the debenture debt from £875,000 to £437,500.

Under the sale agreement the company guaranteed the subscription of £212,500 debentures of the new company, and in placing these debentures, £148,750 of the above mentioned shares were distributed as bonus. It is proposed to distribute the remaining £250,000 shares to the shareholders in reduction of the share capital as mentioned above, and the necessary resolution will be submitted to the shareholders at the general meeting for their approval.

The new company was duly registered on July 18, 1913, as the Hydraulic Power Company of Scandinavia, Limited, and the sale was completed on Aug. 18, 1913.

One of the underlying conditions of the scheme of reorganization was that the company should seek release from a contract with the Sulphide Corporation, Ltd., for the supply of a large amount of slimes concentrates and thus relieve itself of liabilities in connection with the financing of the ore deliveries and the erection and working of a roasting plant.

The result of the negotiations with the Sulphide Corporation was that an arrangement was made for the contract to be cancelled in consideration of the sum of £63,000, which sum had been paid on account in the terms of the contract. This arrangement enables the company to provide for the utilization of the whole of the electric energy contracted for.

The trustee for debenture holders is the Earl of Kintore. The directors consist of Otto C. W. Cedercrantz, of Kalmar, Sweden, Governor of Province (chairman); Knut Tillberg, of Nygard, Gamleby, Sweden, lawyer; Dr. Alfred List, Behrenstrasse 63, Berlin W. 8. Germany, banker; John Alexander Stirling, 33, Old Broad Street, London, E. C., stockbroker; and John Collett Moulden, metallurgist, of Seaton Carew, County Durham, England (managing director).

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The Safe Handling of Missed Holes

In the issue of May 13, the JOURNAL printed an editorial on the subject of missed holes. Following this, we addressed communications to various mining companies asking for their practice in the treatment of missed holes and their opinions on the subject. This article is designed to sum up the testimony received.

The subject is an old one, as old as blasting itself. The danger of accident and death from the explosion of missed holes has been always recognized by mining companies and has been in most cases a matter of diligent attention and stringent rules. The current agitation in favor of safety first, and the attempts to reduce the mining death rate in the United States to a decent figure, render the subject of timely interest, even if not new.

The great cause of mining accidents is falls of ground, and it will probably always so remain. The next most important source, as abundantly proved by figures for all countries, is explosions of powder. There is this important difference between these two hazards, however, namely, that the first is extremely hard to guard against, the governing conditions being infinitely variable, whereas the second can be attacked with much greater success and a standard code of rules prescribed. Among explosive accidents, it is probable that those due to missed holes predominate, and the detection and removal of these is a subject of the greatest importance.

A missed hole once found, the question of how to render it harmless arises. In general, three lines of procedure are open, namely, to remove the powder by picking it out, to explode it with a new primer, to drill a new hole near by, but at a safe distance and in a safe direction, and explode the old hole with the new one. The object of our inquiry was to ascertain the opinion of those competent to have one, as to which of these methods was preferable.

In general it may be stated that the best practice favors shooting the old charge with a new primer, although exceptions to this are to be found. L. F. S. Holland states that the Smuggler-Union company uses the new

primer and does not permit the powder to be picked out. Robert E. Hanley, of the Mammoth Copper Mining Co., favors the use of the new primer in most cases. This is also the practice at the Calumet & Arizona. Mr. Gorhing, superintendent of mines, writes that in his opinion the only method of treating a missed hole is to insert a new primer and that he knows of no circumstances under which it would be safe to drill a new hole nearby, or to clean out the old powder. Frank Juliff, foreman of the same company, concurs and adds that he would advise that no drilling in the vicinity be done in drifts, raises or slopes while any powder remains in the holes. M. W. Mitchell, the other Calumet & Arizona foreman, agrees in general, but would permit the cleaning out of the powder in exceptional cases.

W. H. Staver and E. B. Miller, of the Liberty Bell, unite in recommending shooting the old charge. In the event of this method failing, Mr. Staver favors cleaning out the powder or possibly drilling a new hole, if this can be safely done. Mr. Miller remarks upon the fact the collar of the missed hole may be shot off, leaving no room for a new primer. In such case, he would plaster the new primer over the hole and shoot it. He would never dig out the powder, but would permit drilling a new hole when necessary.

The rules of the Hecla Mining Co. governing the subject of misfires are quoted by James F. M'Carthy, manager, as follows:

Miners who have blasted, on coming off shift, must notify the shift coming on if there have been any missed holes and how many, so that they may have full knowledge of the matter. In such cases also the miners coming off shift must write plainly on the blackboard in the shaft house the places where they have left any missed holes and the number of such missed holes. Miners going on shift must examine said blackboard for the record of any missed holes before going to work.

Every employee, after spitting a fuse, must remain within hearing distance and count the number of shots he hears and carefully note the number of missed holes, if any. No employee shall under any circumstances approach a missed hole within 20 min. after spitting the fuse.

Employees must carefully examine the workings before setting up machines, for loose or scaling rock or any element of danger and all missed holes must be fired before drilling is commenced. Picking giant powder out of a hole is strictly forbidden. No tamping of powder with steel or iron bars is allowed.

It will be noted that the rules prohibit the cleaning of the holes. A copy of these Hecla rules is given every man on the day he begins to work, and a copy is kept posted in the shaft house.

Percy E. Barbour, manager of the Uwarra Mining Co., writes as follows:

I am not in favor of drilling a hole adjacent to a hole which is full of unexploded powder. In our present work we invariably shoot the hole over, first carefully drawing out the tamping and old primer and inserting a new one. Our primers are made by inserting a fuse and fulminate cap in the end of a stick of powder, the top of which is tied around a fuse. Therefore after the tamping is withdrawn this primer can be pulled out by a gentle tug on the fuse. The old fuse is cut off and the primer and old cap put back in the hole and a new primer made and inserted. If, as sometimes happens, the primer explodes and leaves unexploded powder in the hole we handle it in one or two ways. If there is little powder in the hole and shooting will not seem to break enough rock to pay for smoke delay we take out the powder, but we first fill the hole with water to prevent any chance of explosion. If the contents seem to promise sufficient results we put in a new primer and shoot the powder that is left. As to the detection of missed holes; in our drift work it is easy to tell by the looks of the face whether the hole has failed to go or not. If the hole has been shot, but leaves a boot-leg, these are all tried with a tamping stick to discover if there is any unexploded powder left in the hole.

To pull out the old primer is equivalent in danger to cleaning the hole. Presumably, this primer is on the top of the hole. Mr. Bilharz, general manager of the Doe Run Lead Co., follows the same plan and recommends that the hole be cleaned and that no new hole be drilled.

It is evident that neither extraction of the unexploded charge, nor drilling a new hole, is considered safe by most operators, although Mr. Barbour and Mr. Bilharz advise extracting the primer or the powder, and several others would permit it when necessary. This would seem to represent about the sentiment existing in the industry, and agrees with our own view that leaving the old charge undisturbed and exploding it with a new primer is by far the safest course to pursue.

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Artificial Diamonds

A claim for the production of diamonds by electrolysis of calcium carbide is made by E. du Boismenu, of Paris, in a pamphlet on the *"Fabrication Synthétiqque du Diamant,"* according to *Engineering,* Aug. 15, 1913. Francis P. Mann describes the experiments which were made in 1908, and which he did not witness, in *Metallurgical and Chemical Engineering,* June, 1913; Mann did see some of the diamonds which the well known Paris chemists, Lacroix and Maquenne, are supposed to have pronounced to be pure carbon. As stated, the experiments took place in and before 1908, with rather primitive apparatus and insufficient means; the process is said to be covered by the French patent No. 4566, of 1907, and the experiments do not appear to have been resumed. The furnace was fitted with two horizontal electrodes, which were carbon rods approaching one another within 24 cm. It was charged with calcium carbide, fused by the continuous currents applied.

At the end of a run of twelve hours—the apparatus did not permit a further continuation of the experiment—the carbide was found to be "enriched" with fine crystals near the anode. In the space between the two electrodes the carbide was left undecomposed. The cathode, however, was surrounded by a black mass, from which some flakes of graphite and also some colorless, mostly quite irregular, crystals or globules were isolated, which consisted of pure carbon. When the furnace had been run for six hours, the length of these crystals was 1.5 mm.; the length increased with longer runs, and crystals of 2.7 mm. were obtained by the run of 12 hours; the rate of growth was generally 0.2 mm. per hour. Mann points out that the crystals certainly did not look as if they had been produced by breaking up natural diamonds. It is hardly advisable to express an opinion. Yet one would rather expect to find the carbon near the anode, and the metallic calcium to travel to the cathode; it is stated that rose-colored vapors of burning calcium (and carbon monoxide) escaped, and that the cathode was enriched near the anode by carbon migrating in that direction. Du Boismenu refers, of course, to Moissan. It is very doubtful, however, whether Moissan's good crystals of so called diamonds were really carbon; he did not try to burn the few fairly large crystals he obtained in oxygen, and other workers have acknowledged that they were, in similar researches, deceived by small crystals of silicon carbide and alumina (corundum), both of which are nearly as hard as diamonds. Moissan burned only some small crystals.

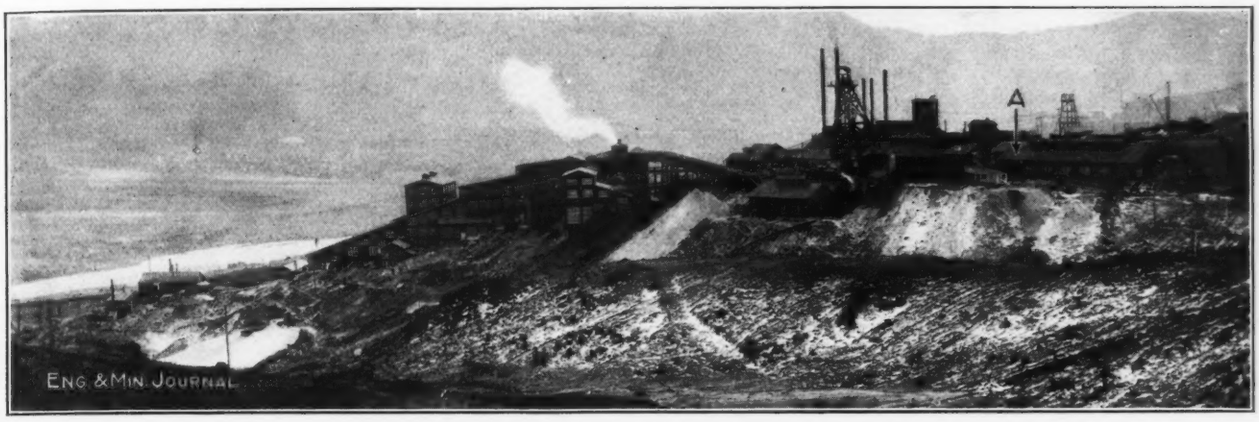
PHOTOGRAPHS FROM THE FIELD

GENERAL VIEW OF BUTTE & SUPERIOR PLANT, LOOKING SOUTHWEST

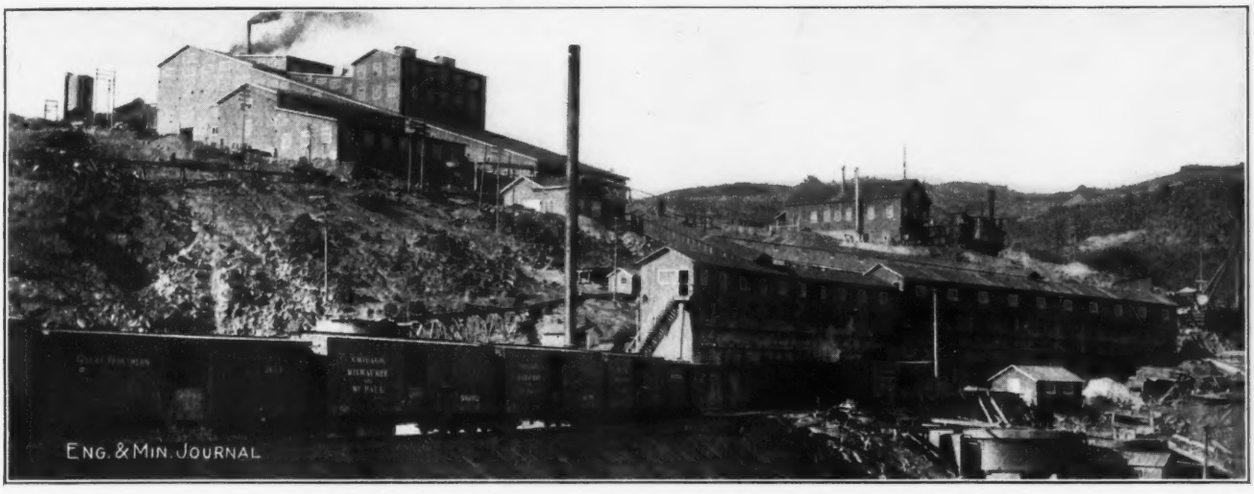
In background shafts of Tuolumne Copper Mining Co., Speculator shaft of North Butte Mining Co., Tramway, Berkeley Mountain View, High Ore and Diamond shafts of Amalgamated company. Different sections of Butte & Superior property are: A, headframe; B, machine shop; C, change house; D, boiler plant; E, steel ore bin and secondary crushing plant; F, main mill building; G, settling tank building; H, laboratory and testing plant; I, concentrate bins. Black Rock shaft, 1620 ft. deep, is main working shaft. From it zinc ore carrying 20% zinc is being mined from nine levels, highest of which is 700-ft. level. This ore is hoisted, crushed, and conveyed to the secondary crushing plant, thence to main mill building where it undergoes complex water concentration followed by oil filtration. Normal capacity of plant is 1200 tons of ore per day which can be readily increased to 1400 tons per day. Present production of zinc concentrates is 12,000 tons per month, containing 12,000,000 lb. of zinc, recovery being about 90% of the zinc.

BUTTE & SUPERIOR COPPER CO.'S MILL AT BUTTE, MONT.

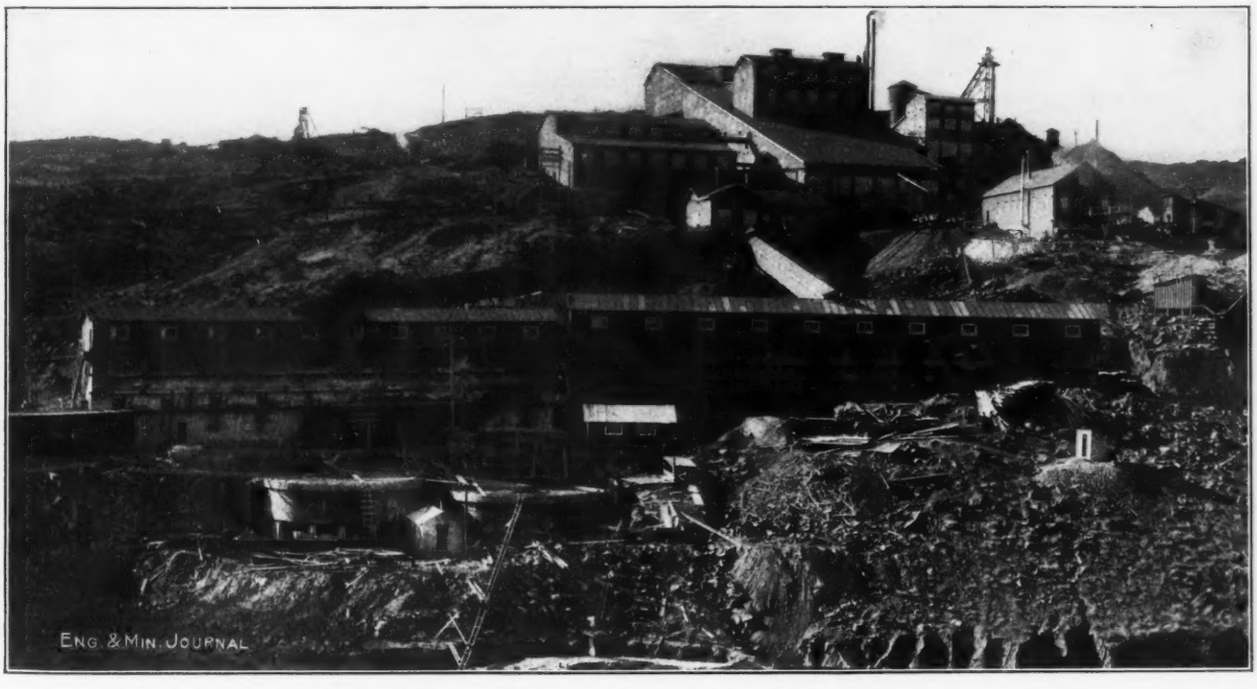
Looking East showing the Great Northern Ry. track climbing the continental divide in the background. A, mine-foreman's residence; B, carpenter shop; C, machine shop; D, timber-framing shop; E, hoist room; F, boiler house; G, office; H, compressor house; I, water storage tank; J, main mill building.



LOOKING TO SOUTHEAST WITH SILVER BOW CREEK AT THE FOOT OF THE HILL
The continental divide is in the distance. The carpenter shop is shown at A.



THE MILL BUILDING, LOOKING JUST NORTH OF WEST
In the foreground are the concentrate bins, of a capacity of 2500 tons and a train load of concentrates.



LOOKING WEST AT HEADFRAME, AND MAIN MILL BUILDING
Settling-tank building, laboratory, concentrate bins are also shown and in the foreground the settling tanks for drainage from concentrate bins.

CORRESPONDENCE AND DISCUSSION

Motor Trucks for Mines

On p. 457 of the JOURNAL of Sept. 6, 1913, appears an article "Motor Trucks for Mines," which it would be well to analyze more deeply before coming to the hasty decision that the truck is at fault. I have no connection with the company which manufactures the truck used and write this in a spirit of one who wishes to see fair-play. I am, in fact, connected with a rival company. I have run across many similar instances wherein the purchaser of the truck was himself entirely to blame for the want of success.

To begin with then, the truck purchased is one of a well known make, has proved itself over many years and to my own personal observation is capable of doing good work.

I have seen exactly similar trucks doing heavy work, day in and day out, round the steep hills of Pittsburgh, and making no fuss about it. It is highly probable that the truck supplied was in every respect up to its standard and that therefore if it fell down on the work, there was something radically wrong with the conditions. The average grade down which the load was to be taken is 10%, the steepest being 14%. Now this is nothing exceptional, and is, in fact, much in favor of the truck, as during this run with the load, practically no gasoline would be consumed, and only a small amount of oil in the engine.

The principal work would fall on the brakes, and as there are two independent sets on this make of truck, the driver should have used them alternately, allowing the other to cool off. This work would have happened chiefly in the 2000-ft. stretch of 14%. Further, the use of the engine as a brake (going down on compression) is quite usual, and a simple change in the carburetor would have converted the motor into a serviceable brake, which could be used for emergency purposes. The motor is used as a brake regularly on motor trucks running in the mountainous parts of Europe.

The clue to the situation is given in the statement that rubber tires lasted only a week. The tire manufacturers usually guarantee their product for 8000 miles. This mileage is often exceeded, and road conditions must be exceedingly severe to make the tires run out their mileage at 150 miles, which is what this truck seems to have been doing as a maximum per week.

This statement is ridiculous and is grossly exaggerated. I have taken trucks over rough, gritty country roads and over 18% grades with rough surfaces, and tires never did wear anything as fast as that. On the whole, therefore, one should be strongly inclined to investigate further the statements made by Mr. Sonne, as it is only too probable that his conditions were quite unsuitable for any kind of motor hauling. No one knows any better than the manufacturer that there are many cases where a motor truck will not operate successfully, and is may be assumed as a fact that he is not at all anxious to sell a truck under these conditions. The failure reacts much more strongly on him than it does on the purchaser.

JOHN YOUNGER.

Buffalo, N. Y., Sept. 16, 1913.

Public Land Withdrawals

The article in the JOURNAL of Sept. 20, 1913, on "Extralateral Rights" is about as concise and convincing an argument against the continuance of this antiquated piece of legislative folly, as can be made within its compass.

The closing sentences, however, leave the impression that the author considers the decisions of the Supreme Court and the various interpretations of the application of the law to be well settled. I quote these last sentences:

> It would seem that the law of extralateral rights under the statute of 1872 is practically settled. It is fully settled, when applicable to conditions which have presented themselves for adjudication, yet the forms of mining locations may be so variant, and the position of veins within the vertical boundaries thereof so strange and peculiar, that many complications now unthought of, may present themselves for adjudication, but, if the courts continue to bear in mind the purpose and intent of the Mining Act, and the principles already settled, no serious difficulty will arise in determining the law applicable to any complications.

To arrive at the conclusion that no serious difficulty will arise, after having just quoted case upon case where eminent authorities have come to diametrically opposed conclusions, and one where *three* different interpretations of the application of the law on the unappropriated rights to a vein on the dip are shown, surpasses my understanding.

However, it is not my purpose to dwell on this subject, as I wish to call the attention of my fellow sufferers to a sin of omission which is practiced by the U. S. Land Office, that of failing to notify the public effectively of withdrawals of the public domain from entry. Such withdrawal is quite frequently made at the request of some of the departments of the Government, by a letter addressed to the local land office, either by the Secretary of the Interior, or the Commissioner of the Land Office, and then the local office delegates one of the force to enter the withdrawal on the margin of the township plat, and to color the withdrawn portions of the township to call attention to their withdrawal.

It may be that the withdrawal was only a temporary one and that the lands were restored to entry at some future date, when a similar marginal note may appear, but the coloring would probably be left, and the casual inspection of the plat might lead to the erroneous conclusion that the land was still withdrawn, especially if the notice of restoration happens to be recorded on some other portion of the margin, than the notice of withdrawal, which happens rather frequently.

No record outside of this one is kept at some of the land offices, at others there is in addition to the plat a record book, which on a printed form shows the status of the various entries, withdrawals, restorations, patents granted for mineral, homestead and other entries.

To emphasize the point which I wish to make, namely, that the record of these withdrawals and restorations of public lands should be communicated in every instance to the recorder of the county, where such lands withdrawn or restored are located, I shall cite a case, coming under my personal observation.

Some mining claims had been taken up in Colorado. The locations had been made in conformity with the statutes and the local regulations. An inspection of the county records showed, that there were no serious interferences by prior locations, as no work had been done in the district for a number of years, as evidenced by the lack of assessment work records in the recorder's office and from the testimony of residents.

Upon looking over the records of the state engineer, it was found that the waters of a stream on the claims had been appropriated at one time for the purpose of developing hydro-electric power, further inquiry at the Forestry Department and at the office of the locating engineer showed that the former had never issued a permit to the locators and appropriators of the water and that the latter had lost track of the promoters of the enterprise and considered the scheme abandoned.

It then remained to ascertain in the land office whether the lands filed on were United States lands, open for entry. This investigation had been left to the last for two reasons. In the first place, the persons living in the immediate vicinity of the claims maintained that the entire district was open to mineral entry, the only restrictions being those incident to its being comprised in a forest reserve, and in the second place, that the United States land office is, or was, at that time at Montrose, practically a day's journey from Denver.

When I reached Montrose, it did not take me long to realize that Pascal hit the nail on the head, when he wrote in his "Pensées," anent the cussedness of inanimate nature and matter, "The last thing you find out, when doing a piece of work, is what you should have done first."

About five sections of a township had been withdrawn from all entry by the Secretary of the Interior on the request of the Reclamation Service, as there was a possibility of part of them becoming necessary or expedient at some future time in connection with a reclamation project, since completed. This explained why the promoters of the hydro-electric development laid down their arms and why we did likewise, the withdrawal covering the claims under consideration.

A similar case happened in connection with some properties in Arizona, only this time, keeping in mind Pascal and my former experience, I went to the land office first, thus saving myself a great deal of unnecessary work. It seems to me that the land office should at least file a statement with the recorder of the county where a withdrawal or a restoration takes place, a notice of such withdrawal, giving a description of the lands withdrawn, thus giving notice to the locator of the existence of this vital interference, at a point that he or his representative is bound to visit when he files his location notice. There should also be a notice of the withdrawal posted on the property itself or at a post office on the ground or its vicinity, so that the local people would be apprised of the action of the department.

Had this latter course been adopted, neither the Colorado nor the Arizona locations would have been made, as in either case there were sufficient local people who would have called the attention of the locators to the withdrawal, as no secrecy was observed in making the locations.

It may occur to the reader that an inquiry by mail would have brought the required information from the department, which is no doubt correct, only in this case, it was considered necessary to make a personal investigation of the records, which is much more satisfactory, especially in a case involving a large expenditure.

The regulations imposed on the locator by the statutes and the various rulings of the land department are stringent and detailed enough to warrant the other party to the transaction, viz., the United States Government, to throw the additional safeguard around the locations, which can be obtained by the recording of the withdrawal of lands in the county offices and the posting of notices of withdrawal and restoration on the lands in question.

The locator is not always a man who is well versed in the matter of titles to the United States mineral lands, and would generally neglect writing to the land office, to find out whether the property he has located was open to entry at the time of location. but he could hardly fail to have his attention called to the fact of the lands having been withdrawan, if the local population had notice of it.

H. J. HOHL.

San Francisco, Calif., Sept. 26, 1913.

Some Close Work in Iron Mining

In the JOURNAL of Sept. 13, 1913, there is an article by Dwight Woodbridge, taken from the "Transactions of the Lake Superior Mining Institute" (p. 506), in which the following statement appears:

> In New York State there are large deposits of magnetites running, say, 40% iron and up to 2% phosphorus, that are being made into a high-grade bessemer ore by the elimination of the contained apatite, which is the mineral carrying the phosphorus. At Mineville they are now concentrating these 2% phosphorus ores at the rate of 1,000,000 tons per year, which is the capacity of their mills when working one shift per day. In these mills they are bringing their 40% ore up to 65% and their 2% of phosphorus they are reducing to 0.03% and they are making a product that does not vary from one month to another more than four or five one-thousandths of 1% in its phosphorus content. Such close work seems almost uncanny.

To one familiar with the Eastern magnetites and their treatment, such a statement provokes only a smile or at most a good laugh. Thinking that the members of the Lake Superior Mining Institute might take the statement seriously, I take the liberty of replying.

Mr. Woodbridge has fallen into error by forgetting that at Mineville at least three grades of ore are mined and three corresponding grades of concentrates are produced. The ore he describes as a 2% phosphorus ore is the "Old Bed" ore and a typical analysis of the crude ore and resulting concentrate is as follows:

"Old Bed" Crude		"Old Bed" Concentrates	
Fe	59.59	Fe	67.34
P	1.74	P	0.675

These figures are taken from *New York Museum Bulletin* No. 19 (Newland and Kemp), p. 82. Although published in 1908, I am sure that the statement as to phosphorus elimination is as good now as then.

The fact is, there is also produced at Mineville, a "Barton Hill" Ore, which is a bessemer ore in the crude and of course a bessemer ore in the concentrates. To confuse "Old Bed" and "Barton Hill" in showing concentration results, would be like confusing a high-phos-

phorus Iron River District ore and that from the Pewabic mine at Iron Mountain.

To show further the results in concentrating high-phosphorus ores, I give below some typical results secured at the Cheever mine near Mineville. This property is controlled by the Bethlehem Steel Co.

Cheever Crude Ore	Cheever Concentrates
Fe = 38.00%	Fe = 61.00%
P = 0.426%	P = 0.32%
SiO_2 = 30.00%	SiO_2 = 9.00%

In this case the iron enrichment is secured almost entirely by the elimination of the SiO_2. In "Old Bed" Mineville ore it is secured by the elimination of SiO_2 and also pyroxene and hornblende, which are weakly magnetic. In both cases it is seen that a considerable percentage of the phosphorus in the crude ore remains in the concentrates.

I am sure the people responsible for the fine concentration results in eastern New York do not see anything "uncanny" in their achievements, but they may think there is something "uncanny" in the way their results are presented to the Lake Superior Mining Inst.

W. L. Cumings.

South Bethlehem, Penn., Oct. 22, 1913.

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Argo Mill, Idaho Springs, Colorado

In the Journal of Aug. 30, 1913, there appeared an article on the Argo cyanide mill, at Idaho Springs, Colo. We are keeping in close touch with the operation of this plant, as there are a number of our machines there, beside the fact that continuous counter-current decantation is used to recover the dissolved values. We wish to bring to your attention the following facts in regard to the Argo article.

The flow sheet, as published on p. 387, was one of several that were drawn at the time the mill was first talked of, but does not represent the flow of the mill as built, nor as operated today. The slime overflow from the duplex Dorr classifier in actual practice passes through a spitzkasten, the underflow from which is handled on No. 1 Card table. The overflow from the spitzkasten goes to Dorr *A*. The overflow from this can either be sent to precipitation via the clarifying filter, or be pumped direct to the head of the mill.

The underflow from Dorr *A* goes to the first agitator, which is a 20x12-ft. Dorr machine, and not to Card table No. 1, as shown. The other agitator is a Parral, which is causing a lot of trouble on account of the continual building up of the solids. The overflow from the Parral passes to Dorr No. 1 (thickener), and the flow through the three other thickeners and the Dorr classifier used as dewaterer is approximately as shown. The dewatering classifier is one of our three-deck washing machines which is used to wash out any dissolved value contained in the sand coming from the Card tables, and to recover the cyanide.

The middlings from the first set of Card tables pass to tables Nos. 2 and 3, the whole of the product from which, except the concentrate, going to the tube mill and Dorr classifier operated in closed circuit. The slime from this classifier gravitates to the two tanks, Dorr *B* and Dorr *C*, which are thickeners and not agitators. The thickened overflow then passes to the first Dorr agitator and on to the continuous decantation system.

In the sampling mill the 24-in. conveyor belt shown should be a cast-iron trough conveyor.

J. V. N. Dorr.

Denver, Colo., Sept. 22, 1913.

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Questions and Answers

Skimming Tailings Dumps

I read with great interest the description of recovery of valuable material from cyanide-tailing dumps appearing in the Journal of Mar. 22, 1913. As this information was new to me, I had the crusts of our dump assayed at once and found that they contained sufficient gold and silver to warrant re-treatment. I would appreciate a full description of methods.

Subscriber.

The crust appearing on the surface of cyanide-tailing dumps is due to the evaporation of water from solutions containing dissolved gold and silver. Loss of water from the surface induces the rising of more solution through the capillary openings in the tailing, resulting in a concentration of gold and silver salts in the surface crust. These salts are, of course, soluble in water, and all that is necessary to recover the valuable materials is to dissolve, separate solution and solids and precipitate. When an operating mill is at hand, the recovered skimming is simply added to the material under treatment.

Skimming the dump may be performed in several ways, depending upon the result desired. If a very rich product is desired for sale to a smelting or milling plant, an extremely thin layer should be taken up, confining the material recovered, as nearly as possible, to the pure surface crust. This can best be accomplished by sweeping the surface lightly with a broom, operating on a quiet day, so that the valuable dust may not be scattered by the wind.

The dump surface, especially when it contains much slime, is very likely to be full of cracks through which most of the valuable dust may be lost. This difficulty is avoided by going over the surface to be swept and tamping the cracks with a shovel handle, or some similar instrument, closing the cracks and allowing the surface to be swept without losing the dust.

Should an operating mill be at hand, it will very likely be desirable to take up more than the surface crust, for the upper half or three-quarters of an inch will be impregnated with the valuable salts. In this case a square-pointed, long-handled shovel is used, taking up the surface for the required depth and forming little piles, which are later taken to the mill and treated along with the ordinary material. The depth which it is advisable to recover should be determined by experimental testing.

After a dump surface has been thoroughly skimmed, the whole process may be repeated by flooding the surface with a small quantity of water and allowing it to dry off again. The process is assisted by loosening the dump surface by plowing or spading, allowing the water to reach considerable depth. If running water is not convenient, rain will accomplish the desired result as well. Current tailing from a mill may be disposed with a view to future skimming, using new dump locations or depositing it over old dump which has been skimmed so often that further working is not profitable.

EDITORIALS

Metal Market Reports

Every two or three years we are attacked by somebody on account of our metal-market reports, especially copper. This has been during the last 25 years or so and is about as regular as colds in the head recurring in winter. The latest comes from Chicago. Our quotations are used extensively as bases for commercial transactions, buying and selling, and consequently they are often criticized, sometimes for being too low, sometimes for being too high. Naturally, everybody is not always suited.

We quote the market as it is according to actual transactions. We derive information from numerous quarters, both selling and buying, we make use of all the reliable reports that we can get, and we summarize the data, often discordant, to the best of our ability. We consult the agencies and smelters, to be sure, for it is they that sell the metals, and nobody could know much about the market otherwise. In fact, their offices *are* the market.

Our quotations are generally referred to because they are accurate. About all of the producers report each year what they get for their copper. Some sell on the basis of our quotations; many do not. It has not been observable that the latter realize more for their output. On the contrary, they do not on the whole come quite up to the quotational average. Persons—who think the markets are higher than they are—ought to try selling on their own account. We can't do anything but report the facts.

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The Flotation Process

The 600-ton experimental mill of the Inspiration Consolidated is expected to be ready for operation early in December. In this mill such mineral as can be extracted by gravity separation will be taken out in that way, after which the remainder of the ore will be treated by the flotation process, experiments with which have given highly encouraging results. The Inspiration company has, indeed, entered into a contract with Minerals Separation, Ltd., and contemplates the eventual installation of the process in a 6000-ton mill.

The caution of the Inspiration management in starting with only a single unit is explained by some opinions expressed at the last meeting of the New York section of the Mining and Metallurgical Society, at which the flotation process, speaking generally, was the subject of discussion. It was brought out there that the Minerals Separation process in some cases has been found to give seriously variable results according to just how it is handled, which statement *per se* is not, of course, unusual. A more precise statement would be, perhaps, that the oil flotation process requires more expert handling than does the ordinary method of gravity concentration.

Anyway, it is well known that the process installed by the Braden Copper Co. in Chile gave excellent results so long as it was operated by the experts from England. After they had turned the mill over to the mining company's men and had gone home the percentage of mineral extraction fell off very seriously, which is one of the main reasons why Braden has failed to make its expected production. The experts were recalled from England and they have improved things, but whether they will succeed in properly instructing the regular mill force remains to be seen. The Inspiration management has, no doubt, had this experience in mind.

Of course, the Braden experience may not be universal; probably is not. Nothing of the kind has been reported from El Cobre in Cuba or from Britannia in British Columbia, so far as we know. At both of those places the Minerals Separation process is said to be giving very satisfactory results.

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Engineering English

Prof. H. R. O'Brien, of the Oklahoma Agricultural and Mechanical College, Stillwater, Okla., contributed to *Engineering News,* of Nov. 6, 1913, an article in which he discusses the generally defective English of graduates of American engineering schools. Professor O'Brien introduces his argument by the following illuminating remarks:

"There is a reproach attached to our engineering graduates, largely because they cannot express themselves in a written document," declared Prof. J. J. Flather, of the University of Minnesota, in a discussion on Engineering English, at a recent meeting of the Society for the Promotion of Engineering Education. To drive home this statement, he tells that some years ago a request came to him for a graduate of the mechanical-engineering department. The only limitation imposed was that the applicant should be able to write English correctly. The position was that of assistant to the works manager "who wanted a man that could express himself properly in English." "There were 26 men who graduated that year but I could not recommend any one for the position," declared Professor Flather. Not long since, the department of English at the Massachusetts Institute of Technology issued a pamphlet in which were printed a number of letters of application which had been written by graduates of that institution in answer to an advertisement that appeared in "Engineering News." These letters had been turned over to the department by a graduate now in a responsible engineering position, who had inserted the advertisement. Each of these letters had been written in such poor English that this alone had been sufficient to keep the writer from being employed for this $3000 position.

Instances such as the above might be multiplied indefinitely. What is true in regard to the graduates of these two great engineering schools is true of practically every engineering school in the country. Engineers as a rule do not know how to use good English. They are weak in the most common fundamentals of grammar, punctuation and spelling. How to arrange a technical report according to the rules of unity, coherence and emphasis is beyond their utmost conception. The idea of filing a report on electrolysis at the general office or submitting specifications for building a concrete sewer, in clear, concise sentences and paragraphs, never enters their minds. These things are not by any means true of all engineers. Many of the older men in the profession use good English because they have served years of apprenticeship in the college of Hard Knocks. Among the younger men who have gone out from the engineering schools in the past few years, it is true—more true than most engineers are willing to admit.

Engineers often give as their excuse for poor English that an engineer does not need to know how to write. Any

man who makes such a statement is unfit to be called an engineer. Clear, definite, concise writing is, perhaps, the hardest to write, and yet this is the kind that the engineer is constantly called on to write. True, he does not have to write glowing descriptions of the sunset, nor does he have to work out essays on honesty. He does have to write letters of application, where his letter is put by the side of a dozen or a hundred others and his chance for the position depends upon his ability to state his case better than the other fellow. There are specifications to be submitted in competition, where the one that gets the award is the one that is expressed in the clearest manner. Contracts are to be drawn where one obscure clause may bring on a lawsuit. Reports must be made to superior officers that will bring promotion or discharge—depending entirely upon the work. That an engineer needs English is too obvious to be discussed more.

The theme of Professor O'Brien's paper is the responsibility for the situation that he describes and the steps that should be taken to correct it. It does not interest us to reproduce that part of his paper which especially concerns the professional teacher. It is sufficient for us to join in driving home the fact that Professor O'Brien states, not only to undergraduates, but also to graduates; and the important bearing that deficiency in their use of language may have upon their careers. We are glad that this is becoming recognized in several of the leading schools, which are giving more and more attention to the matter.

In this connection the influence of the engineering press is not to be overlooked. The importance of the technical paper as a tool of everyday necessity and use, just as much a tool as a transit or an assay balance but of immensely greater magnitude in scope and application, was never more commonly recognized than now. Every man engaged in any art is still a student, and he is a backward student who does not make use of the special paper of his art and profession. That such use is increasingly made is evidenced by the increasing number of both readers and contributors.

In the writings of the latter that come to our office we think that we have discerned an improvement during the last 10 years. In saying this we do not have any individual in mind. We have not even any statistical records bearing on the subject. It is simply an impression that there is not now the necessity of "rewriting" so much to winnow grains of good wheat out of a nearly hopeless chaos of chaff, nor so much correspondence with authors to elicit from them a clarification of their obscurities as there used to be. On the whole, the contributions that come to us now are pretty well done; many are very well done.

This may be partly the result of work in the engineering schools, partly of the work of the engineering papers. The man who submits a carelessly phrased contribution and critically examines its mutations in editing is apt to derive some profit therefrom. In this particular, Doctor Raymond has been one of the greatest teachers that we have ever had, and the long series of his volumes of the transactions of the American Institute of Mining Engineers has been one of the greatest schools.

We recall the adage that an old dog can't be taught new tricks, but an old practitioner can be taught, or can teach himself, to write good English. There is a man of a name that ranks among our greatest, who was well along in years when he wrote his first book. The Ms. of that book was a tangled jungle of literary effort. However, the ideas were there, and after they had been rewritten by a humble hack both the book and its author became famous. The author subsequently directed his attention to the use of language and made of himself a purist and a stylist, one of those whose work is passed by the editor to his assistants with the directions, "Take no liberties with this Ms. Edit it for typography, but let it be set up just as the author has written it."

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Book Title Page Dates

The McGraw-Hill Book Co., in one of its recent bulletins, takes up a question that is of much interest and importance to buyers of engineering and technical books. It states the case and gives the answer in so concise and conclusive a way that there is but little that can be added. It says:

For several years we have adhered to the practice of retaining as a title page date the year of first publication of a book, on all books manufactured by us, until the book was thoroughly revised, and calling our reprints "Impressions," not "Editions." We have believed that "Second Edition" should mean a revision, and that unless the revision was thorough—not merely plate corrections—the title page should bear the date of first publication, and the reprint should be labelled "First Edition, Second Impression," without alteration of the title-page date.

We have had occasion recently to protest to another publisher against this practice of calling reprints editions. This has been brought about by the complaints of some of our customers, who regularly buy all of their technical books from us, that they had purchased a so called new edition of a book of this publisher which was not, in fact, a new edition, but only a reprint.

Very recently a well known bookseller urged us strongly to adhere to "the old-fashioned custom of changing title pages because his customers frequently hesitated to buy one or another of our books, fearing, because of the title-page dates, that they were old."

The morals of this request seem to us about on a par with those of the fruit dealer who puts the fine, large peaches on top of the basket. Our only problem is to determine, in rare cases, whether our revision is sufficient to warrant asking the owner of an old edition to buy the new edition in its place. That is our standard.

The publishing of engineering books is a very different matter from the publishing of fictional literature. There is here no list of best sellers and there is here something of consequence in stating honestly the date of publication. The sale of any engineering book is relatively small, 1000 to 1500 copies for a reasonably successful publication, let us say. The publisher, not desiring to increase his risk unnecessarily, plates the book and prints 1000 copies. If the demand require, after the lapse of two or three years, the printing of another 1000 copies, the original plates are put again on the press. Material changes in them are seldom if ever made, it being very costly to change a book that is in plate form. Errors in names, or even in the statements of a paragraph, may be corrected by cutting out and patching certain plates, but that is about all that is feasible. The second printing is the same old book, and a false impression is conveyed if anything else be represented. The engineer who buys a book bearing upon some subject in which he has become interested, thinking that he is getting something recent because the publisher has advertised it as being of 1910, let us say, and learns from the copyright page that it was really of 1905, ends with the distinct feeling that he has been fooled.

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The promoters of mining companies offering shares to the general public now make a point of advertising that they have been licensed to sell their shares, if such be the case, under the Blue Sky laws of states which are mentioned. Such licenses are, therefore, referred to as a

quasi indorsement of the company's shares. The Blue Sky laws, which have been modeled after those of Kansas, are more or less of a joke. In some cases, they have become a roaring joke, as reported by our Black Hills correspondent in the JOURNAL of last week, who mentioned some of the peculiarities of the South Dakota law. We opine that some day some of these Blue Sky laws will prove to be mischievous.

BY THE WAY

After Huerta, What?

Newspaper reports intimate that Pancho Villa, intoxicated by his success in taking Juarez, is contemplating a desertion of Carranza and the starting of a new revolution on his own account, after the fashion of Señor Orozco. Villa, it is said, was once patio foreman at the Tecolotes mine.

The newspapers report that the Mexican Government is now raising money from the foreign business firms and corporations. Those in Monterey have been "requested" to help to maintain the army in that district. The American Smelting & Refining Co. is said to have been assessed for $12,500, the Monterey Steel Co. for $10,000 and the Waters-Pierce Oil Co. for $7500. It was said at the New York office of the American Smelting & Refining Co. recently that President Huerta has been raising money in this way for two months. "Have you met his demands?" a representative of the company was asked. "We had to, or he'd take us by the throat," was the reply.

This is a recent newspaper dispatch from Houghton, Mich.: "Despite a night of terror at Painesdale and Trimountain, where strikers in ambush fired repeated volleys at deputy sheriffs and mine guards protecting mine property and several workmen had narrow escapes from mobs, all the nonunion men went to work Tuesday morning. The firing, which continued from nightfall to daybreak, is believed by the officers to mark the opening of the campaign to intimidate workmen because of the rapid strides the Copper Range Consolidated is making toward normal production. The force of deputy sheriffs on the South Range has been increased. Tuesday passed without serious trouble. A score of strikers were arrested in connection with the night shooting." This causes us to rub our eyes and wonder whether the Michigan dispatch did not become confused with something from Mexico.

The *Wall St. Journal* reports that India is taking measures to promote gold deposits in banks at a lucrative rate of interest, in order to arrest the burying of gold treasure, as silver has been buried in India for more than 100 years. According to Sir George Paish, the record for 1913 will show another $100,000,000 of gold buried in India, lost to the civilized world of the present time as though it were thrown into the ocean. In 1912 and 1911, more than $200,000,000 of gold disappeared into India. It is no longer safe to talk about the output of South African gold as the cause for rising prices, when an arm of the British Empire is burying 30% of the gold South Africa is producing. Indeed, Sir George Paish believes that we have turned the corner in commodity prices, and that we are now in for a recession in commodity values.

What is going on in business and finance is accurately summarized by the financial editor of the New York *Sun* in these words: The foreign dispatches tell of more and more contraction in leading lines of industry on the Continent and in Great Britain, and it is a common topic of conversation in our own country today that business is falling. It is not in human nature to welcome the processes of cure that are being applied, but if the gravity of the economic disorder which has afflicted us is recognized there is not apt to be so much risk of unwise rebellion against the application of the remedy and of unwise effort to abort the processes of cure. That precisely was the mistake which was made in the sequel to the 1907 panic. We were then unwilling to recognize the panic as proof of the serious derangement of fundamental conditions. The panic was treated as a psychological episode not warranted by facts, and that is one of the main reasons why our times have been out of joint since. There has been a far more sane appreciation of facts in the past 12 months, and the sanity is owing chiefly to Europe's intelligent perception of the disclosures incident to the Balkan upheaval last autumn. That upheaval brought on a worldwide crisis, but the outbreak of war in the Balkans was not the cause of crisis. It was merely the accident which showed that the world's supplies of capital had been extravagantly consumed and that credit has been abused to make up for the deficiencies of wasted capital.

The New York *Sun* clearly has a correct idea of conditions in Mexico, as the following from a recent editorial shows: The Hague War Regulations as to the treatment of prisoners of war state the practice of civilized nations:

> Prisoners of war are in the power of the hostile Government, but not in that of the individuals or corps who captured them. They must be humanely treated. All their personal belongings, except arms, horses and military papers, remain their personal property.

The Federal and the so called Constitutionalist forces have a simpler rule. Death, with sometimes the privilege of digging their own graves, is the law of the vanquished. Often a private soldier of the conqueror on any field or after any siege gives the quietus to a squad of prisoners. A "victory" is followed relentlessly by the murder of the soldiers of the other side who cannot make their escape. There are no laws of war in the Mexican campaign. Santo Domingo or Hayti in its worst days of savage massacre was not bloodier or more brutal than those "patriots" to the south. Other diversions worthy of old Dahomey, violence to women, slaughter of noncombatants, torture, multilation, are reported in sickening numbers, especially in that part of Mexico that enjoys the virtuous activity of Carranza, the benevolent old gentlemen who proposes to execute everybody who adheres to his rival Huerta. Only disgust and horror can accompany the "victories" of these bloodthirsty banditti. The civilization of the 20th century is ashamed before this revival of the cruelest barbarities and butcheries of wars of extermination. How long will the civilized world stand for these monstrous inhumanities?

The Radium Supply

Lecturing on radium before the Society of Civil Engineers, in Paris, last week, M. Paul Blesson stated, according to the N. Y. *Sun*, that the latest statistics on the quantity of salts of radium existing at the present moment in the different scientific and medical laboratories prove that there are not more than 6 to 7 grams of metallic radium in the whole world. From the creation of the radium industry in 1899 under the impetus of Professor Curie up to 1904, only 2 to 3 grams of radium were extracted from 13 tons of pitchblende residues, and these 2 to 3 grams were supplied to the laboratory of M. and Mme. Curie.

Then the Austrian government prohibited the exporta tion of radioactive ore from Joachimsthal and radium had to be extracted in France from much poorer ore, containing 0.5 to 2 mg. of radium to the ton, such as autunites from Portugal and carnotites from Colorado, whereas pitchblende residues contained from 100 to 200 mg. of radium to the ton.

In recent years Austria has not treated more than 3 to 4 tons of pitchblende annually, yielding less than one gram annually. America and England do not yet produce salts of radium. The command of the production and the market are held in France. The price of a gram of hydrated radium bromide is about $80,000, which makes the gram of pure metallic radium worth about $156,000.

The chief holder of radium is Mme. Curie, with about 2.6 to 3 grams. After her comes Sir Ernest Cassel.

[There is a good deal of uncertainty respecting the supply of radium. While the above report appears to come from a good source, we are inclined to think, in view of the considerable shipments of ore containing radium, that are regularly being made from Colorado, that the actual supply of radium must be greater than M. Blesson states. It is worth while to report that the U. S. Bureau of Mines is taking steps to produce radium at Denver, Colo., with the coöperation of Dr. James Douglas, who is greatly interested in this subject.—EDITOR.]

Preparation of Barium Sulphide

In a recent number of the *Gazetta Chimica Italiana* (abstr. *Chem. Tr. Journ.*, Oct. 1, 1913), Messrs. Merino and Danesi described a method which they have devised for the conversion of barium sulphate into barium sulphide at a low cost. It is recommended that a long rotary furnace of iron, lined with refractory material, and slightly inclined to the horizontal, be used, water gas free from carbon dioxide being employed both as reducing and heating agent. Working at a temperature of 600° to 650° C., the size of the discharge opening and the speed of rotation of the furnace are so regulated that the barium sulphate remains in the furnace for one hour; a yield of 95 to 98% of barium sulphide is obtained. The escaping gases contain only traces of hydrogen sulphide. Strontium sulphate and calcium sulphate can be reduced in a similar manner, but somewhat higher temperatures are necessary, and in the case of calcium sulphate small quantities, and in that of strontium sulphate, traces of oxide and thiosulphate are formed in addition to sulphide.

The cost of fuel per ton of barium sulphide produced is stated to be 14s. 6d. less when water gas is employed than by the known method of reduction with solid carbon, and in addition, a purer product is obtained in shorter time and with less labor.

The Chisana Gold District of Alaska

BY PHILLIPS THOMPSON*

The section of the Yukon Territory immediately adjoining the Chisana gold district in Alaska, is one which the Geological Survey of Canada has regarded as offering exceptional promise, and for some years the investigation of the region has been in contemplation. Circumstances prevented this until the present year, when two parties were sent into the district, a topographical party under W. E. Lawson and a geological party in charge of Dr. D. D. Cairnes. These parties were at work in the district when the rush to the Alaskan placer field commenced and Doctor Cairnes visited the discoveries in August to correlate the geology of the Chisana with that on the Yukon side of the line, and to determine whether the gold-bearing gravels are likely to extend into Canadian territory.

He reports to the Survey that throughout a small area within Chisana district, Alaska, not exceeding 10 or 12 miles in extent, rich gold-bearing gravels have been found, but what the adjoining territory may contain is as yet problematical. The geological formations and other general characteristics appear to persist to the eastward well into Canadian territory, 30 to 40 miles distant, and it is quite possible that further valuable deposits of placer gold may be found within this belt.

The original Chisana discovery generally known as the James discovery, is located at about latitude 62° 10′ N and longitude 141° 55′ W. The gold-bearing belt lies along the southern edge of the Notzotin mountains and within 25 miles of the northern slopes of the snow- and ice-capped Wrangell Mountains. The Chisana gold deposits, situated as they are near the head waters of the White and Tanana rivers, are in a district which is difficult to reach, and may be considered one of the least accessible portions of Alaska. Five main routes are available, two of which may be considered as Alaskan and the remaining three as Yukon routes.

The two Alaskan routes are respectively by way of the Copper River & Northwestern Ry., and the Tanana River. All three of the Canadian routes proceed from the tidewater at Skagway River over the White Pass & Yukon Ry. to Whitehorse, a distance of 110 miles. From Whitehorse, the routes diverge and may be named the Kluane, Coffee Creek and White River routes, respectively. The Canadian routes are all available throughout the entire year, but traveling and freighting are easier, quicker and cheaper in the winter, when sleds can be employed. It is difficult to say which of them is the best.

Little was known concerning the particular locality of the discovery until the past summer, but geological work had been performed in adjoining territory on practically all sides of the district, so that a great amount of general information was available. The creeks in which the gold has been found are tributary to the Chisana River, from which the district takes its name. The name

*Oakville, Ont., Canada.

"Chisana" appears on the older authentic maps, the name of "Shushanna," which has frequently appeared in the press, being a corruption. The district is mountainous, but immediately adjoining the gold-bearing creeks, is not rugged, being undulatory in character. The mountains to the north, in which direction these creeks head, are quite rugged and rise to elevations of 9000 to 10,000 ft. above sea level, the James discovery being about 5000 ft. above the sea. All the higher elevations, including the main gold-bearing creeks, are above timber line.

The geological formation is dominantly sedimentary and consists of dark-gray and black shales and slates which are extensively invaded by basic volcanics, occurring prevalently in the form of dikes less than 100 ft. in thickness. The strata of the prominent, easterly-trending range toward which the gold-bearing creeks head, and which are undoubtedly the source of all the placer gold, have been very highly mineralized as a result of this igneous invasion, and have a general bright-red appearance throughout, due to leaching and oxidation of the contained iron-ore minerals. No evidence of glaciation was detected, which partly accounts for the presence of the gold. Had the district been glaciated, the water-sorted accumulations of gold in the gravels would have become scattered through enormous masses of unsorted material, and would thus have been lost.

Gold is believed to have been first discovered in Chisana about May 3, last, by William E. James and Peter Nelson, of Dawson, who had spent the previous winter prospecting in White River district. The partners commenced sluicing on Discovery claim on Little Eldorado Creek, on July 4, and by Aug. 2, had obtained about $9000 from this claim, an average of about $300 per man for each eight hours of work performed. When Doctor Cairnes left the district on Aug. 4, the Discovery was the only claim from which any considerable quantity of gold had been obtained. Since that time, however, from information from what are thought to be reliable sources, it appears that a number of other properties have become important producers.

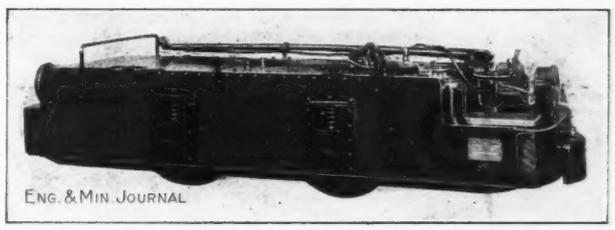
The creek gravels are not frozen in summer, as they are not covered by muck or moss, but the bench gravels are frozen in most places throughout the year. A number of the present streams have comparatively recently formed cañon-like valleys, and in places the material of the older stream channels is quite apparent and the gravels they contain constitute the main bench gravels of the district. From these gravels, it is possible that the bulk of the gold will be obtained either from the old channels themselves directly, or from the present stream channels, where these cut the older gravels. In such places the gold originally in the older gravels is now concentrated in the gravels of the intersecting streams. The creek gravels are easily worked, being in most places less than 4 ft. in thickness, and not over 100 ft. in width and they constitute typical prospector's diggings as a minimum of equipment, time and labor is required to obtain the gold. The hope that the gravels in the adjoining Canadian territory may also prove rich in gold is entertained, as James and Nelson, the Chisana discoverers, claim having found pay in Frying Pan Creek in the Yukon, in the course of their operations last winter. They state that they were obliged to stop work there as water came in so rapidly when they reached bedrock, that the pits had to be abandoned.

Several thousand men went into Chisana district this summer, before the freeze-up, but with rare exceptions they were prepared to remain only a few days, so that possibly there were no more than 300 or 400 persons there at any one time. A number have now returned with large outfits, prepared to spend the winter prospecting and getting ready for work in the spring. A considerable number of cabins are being built and a post-office and mail service established. It is expected that by spring there will be plenty of provisions and ordinary outfits available at the camp, though prices will naturally be high. Practically all the known valuable ground was located by Aug. 1, and all persons going in should be prepared to do *bona fide* prospecting, in which case important discoveries may be made quite outside the area at present considered valuable. Nearly all the fatalities attending the stampede might have been avoided, had those going into the district been properly outfitted.

Pioneer Electric Locomotives in Alaska

What are thought to be the first electric locomotives used in Alaska were placed in service within the past few months for mining operations by the Alaska Treadwell Gold Mining Co., at Treadwell, Alaska. The two locomotives are each of six tons capacity, and are operated on a 500-volt direct-current circuit from an overhead trolley. They were manufactured by the General Electric Co. and are of the standard outside-frame type, with type HM-801 motors having ball-bearing armatures.

The motors are of the usual series-wound type, and the



GATHERING LOCOMOTIVE FOR ALASKA TREADWELL COMPANY

controller is of the rheostatic magnetic-blowout type. A commutating switch is incorporated in the reverse cylinder, the handle of which has four "on" positions, two for each direction of motion, one with the motors in series and the other with the motors in multiple. This system of control, by permitting the motors to be started in multiple, allows them to exert their maximum tractive effort independently, so that the slippage of one motor does not affect the other. The locomotives are operated on the track leading from the central shaft house to the various mills and haul ore trains composed of ten or more trailers aggregating a gross trailing load of 80 tons.

Zinc Smelting in the Electric Furnace

Regarding the slags from the Johnson electric zinc furnace, described in the JOURNAL of Nov. 22, we are advised by Ledoux & Co., that it has assayed a sample of 5854 lb. of slag made in a 266-hour run, with the following results: Sample dried at 100° C.; Al_2O_3, 10.81%; Cu, 0.12; Pb, none; Zn, 0.65; Ag, 0.15 oz. per ton; Au, trace.

PERSONALS

Arthur W. Burgren, of Matehuala, Mexico, is now at 4143 Holbrook Bldg., San Francisco, California.

Herbert C. Enos is at present in Colorado, where he has been inspecting a number of the large mines.

W. F. Battersby has been appointed mill superintendent of the Dome Mines Co., South Porcupine, Ontario.

M. G. Doll has accepted a position as general sales manager with Bury Compressor Co., Erie, Pennsylvania.

C. W. Merrill, of San Francisco, who has been spending two months in the East, returned to San Francisco last week.

R. B. Lamb, of Toronto, Ont., has gone north on a professional trip through the Cobalt and Porcupine mining districts, and expects to return about the end of November.

Kenichi Nakamura, representative of the Japanese government board of railroads, who has been delegated to conduct a series of railroad investigations, has arrived in this country.

C. Ewald Grunsky, Jr., mining engineer, formerly superintendent of the Standard Consolidated Mining Co., has associated himself with the American Engineering Corporation, San Francisco.

Thomas J. Grier, general manager of the Homestake Mining Co., of South Dakota, has been visiting New York. After a trip to the West Indies he will return to New York before proceeding to South Dakota.

At the recent fair, held in Prescott, Ariz., Mohave County, secured first prize for the excellence of its mineral exhibit. The credit for the gathering and arrangement of the exhibit is due almost entirely to W. O. Ruggles.

W. M. Corse, works manager of Lumen Bearing Co., Buffalo, N. Y., has resigned to become general manager of the Empire Smelting Co., Depew, N. Y., on Jan. 1. H. P. Parrock, sales manager, will assume Mr. Corse's duties as superintendent, combining the two offices.

Dr. L. W. Stephenson, geologist and paleontologist of the United States Geological Survey has received leave of absence for four months from Jan. 1 and during that time will act as professor of Paleontology at the University of California during the absence of J. C. Merriam.

Dr. Richard Moldenke, Watchung, N. J., and Walter Wood, R. D. Wood & Co., Philadelphia, sailed for London on Nov. 15 to be away about a month in connection with the committee on specifications for pig iron and castings of the International Association for Testing Materials.

George Nash, general superintendent of the plant of the Pittsburgh Steel Co., at Monessen, Penn., has been appointed general manager of the company's entire works, located at Monessen, Glassport and Hamilton, Ont. C. J. Morgan, former assistant to Mr. Nash, has been appointed general superintendent.

C. V. Kerr, organizer of the Kerr Turbine Co., and later with McEwen Bros., of Wellsville, N. Y., recently joined the staff of the A. S. Cameron Steam Pump Works, New York. Mr. Kerr delivered an interesting address on "A New Centrifugal Pump with Helical Impeller" at the last monthly meeting of the American Society of Mechanical Engineers.

Hymel Davies, of Lexington, Ky., and W. J. von Borries, of Louisville, Ky., announce their connection under the firm name of Davies & Von Borries, consulting mining, civil and industrial engineers. The firm is prepared to make reports, plans, maps and surveys for mining, industrial, municipal and railroad projects and operations, and to supervise construction.

OBITUARY

Dr. Adolf Hoffman, professor of geology in the mining school at Przibram, Bohemia, died recently, aged 60 years. He was well known as a lecturer and writer on geological topics.

Guy A. Du Bois, president and general manager of the Byron Jackson Iron Works, San Francisco, and designer of the gold dredge which bears his name, died Nov. 12 at his home in Berkeley, Calif., aged 45 years. He was a native of New York. He leaves a widow, two sons and two daughters.

Charles D. Smythe died at Angel's Camp, Calif., Nov. 6. He was 87 years old, a native of Prussia. He went to California when a young man and had been a resident of Angel's Camp for 25 years. He was owner of the Smythe quartz mine and mill, and had followed mining since going to California.

W. W. Leach, of the Canadian Geological Survey, died at Ottawa, Nov. 16, aged 41 years. After graduating from McGill University, Montreal, he engaged in mining engineering for a few years until his appointment to the Geological Survey. He was in charge of many expeditions into unexplored areas, and his researches made some important contributions to the knowledge of the mineral resources of Canada. He was one of the collaborators in the preparation of the textbook issued under the auspices of the International Geological Congress on the "Coal Resources of the World."

Jay Morse Pickands, member of the firm of Pickands, Mather & Co., Cleveland, Ohio, died suddenly in that city Nov. 18. He was the youngest son of the late Col. James Pickands, one of the founders of the firm and was born in Marquette, Mich., 1880. He was graduated from Yale in 1902 and 1903 became associated with Pickands, Mather & Co., in the pig-iron department. In April, 1911, he was admitted to the firm. He was a member of the American Iron & Steel Institute and the Union, Country, Athletic, Tavern and Mayfield clubs in Cleveland. He leaves a widow and a daughter.

SOCIETIES

Mining and Metallurgical Society of America—A meeting of the New York section will be held at the Engineers' Club, New York, on Thursday, Dec. 18, at 8 p.m. The subject of discussion will be the one-man drill.

American Institute of Mining Engineers—The annual meeting of the Columbia Section—formerly the Spokane Section—was held at Wallace, Idaho, Nov. 15 and 16. A few members of the recently formed Montana Section were also present. A business meeting on Nov. 15 was followed by a visit to the Hercules mill at Wallace. In the evening a technical session was held at which two papers were presented, one prepared by Professor R. S. McCaffery, of the University of Idaho on the "Electric Smelting of Complex Lead-Zinc Ores," was read by Professor Bard, of the University of Montana, in the absence of the author. The second paper was presented by Rush J. White, of the Federal Mining & Smelting Co. on "Treatment of the Refractory Morning Ores." A lengthy discussion followed the presentation of each paper. F. G. Cottrell, of the Bureau of Mines, told briefly of work which has been accomplished in the treatment of complex ores, especially those of the copper-zinc type. On Nov. 16 a visit was made to the Bunker Hill & Sullivan plant at Wardner, where besides the mill and yards the excellent mine models were seen. A luncheon was held in Wallace after the return of the party. In the afternoon a special train was run to the various plants near Mullan. The Snowstorm mill was visited where the concentration of a low-grade copper ore is the problem. The new National mill was next visited. The construction work is going on at this plant and no machinery has as yet been installed. This mill will handle a low-grade copper ore, but unlike the Snowstorm mill it will be accomplished principally by flotation. The last stop was made at the Morning mill, and this proved especially interesting for it had been described at the technical section by Mr. White. After the return to Wallace the members and their guests partook of a banquet, which was remarkable for the good fellowship shown on all sides.

INDUSTRIAL NEWS

Phillip P. Bourne has recently been appointed chief engineer of the Epping-Carpenter Pump Co., with shops at Pittsburgh. Mr. Bourne was for eight years chief of the engineering staff at the Blake-Knowles steam pump work, East Cambridge, Mass. This appointment is in line with other recent activities of the Epping-Carpenter company, in strengthening its organization and enlarging the plant.

The Dorr Cyanide Machinery Co. has opened an Eastern office at 50 Church St., New York, to handle its expanding business in metallurgical and industrial lines. The Dorr thickener is now being installed by the large copper companies quite extensively, both in connection with water concentration and flotation process. Mr. Dorr will spend a great deal of his time in New York this winter in connection with the business of the company and professional work.

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Nov. 19

Right to Diverge Waters of Owens River through Los Angeles aqueduct is being contested by Natural Soda Products Co. in Superior Court of Inyo County at Independence. It is charged by plaintiff company that 80% of the water sought to be diverged by aqueduct system is contemplated by city of Los Angeles to be sold for irrigation purposes and not to be used for municipal purposes. Plaintiff company complains that aqueduct will wholly drain Owens Lake and destroy the soda industry which is capable of producing 70,000,000 tons of salts.

The California Oil Bulletin, promised by State Mining Bureau is in preparation. R. P. McLaughlin, a practical petroleum engineer formerly in employ of Associated Oil Co., has been engaged to do the field work and prepare data for a bulletin that will treat of practical operation of wells, marketing and refining of crude product. Mining bureau has contributed to geology and chemistry of petroleum occurrences in state more than to industrial and commercial phases of production and marketing. It is the practical side of the industry that is desired by investors in oil wells and by consumers of oil, and it is expected that the bulletin in preparation will fill the demand.

Reopening Pipe Line Cases by state board of railroad commissioners was set for Nov. 20. The common carrier law will be enforced by commission, provided the several pipe line companies can be forced to regulate their rates and terms of transportation to meet requirements of law and satisfy demands of shippers. Regulations to which Standard desires shippers shall submit, unwillingness of Associated to become a common carrier and hope of many producers for an economic system of pipe line transportation combine to give commission a good deal of food for thought. When the commission settles the matter to satisfaction of themselves, constitutionality of the law may rise up to disturb them, as that phase of the situation has not yet been seriously taken up.

DENVER—Nov. 22

Relief from the Coal Strike is now hoped for, as dispatches from Washington, Nov. 18, indicated that the Government is to take part in settlement. The President, it is stated, has instructed Secretary of Labor Wilson, now on Pacific coast, to go to Denver and to bring the factions together. Governor Ammons also hopes to bring about settlement and is in communication with prominent labor leaders with view to have them use their influence with Colorado officers of the United Mine Workers to call off strike, proposing to them that if strikers will return to work he will assist in having a law initiated which will compel arbitration of all further labor difficulties. The morning of Nov. 18 the fifth explosion since strike began, occurred at Piedmont, when dynamite was exploded under the house of the town marshall. Huerfano, Sunnyside, and Black Diamond mines, reopened, troops guarding miners as they returned to work. The Supreme Court ordered State Auditor Kenehan to issue certificates of indebtedness for maintenance of state troops. Denver bankers will cash them charging 4%. Efforts were made to induce United Mine Workers employed in Wyoming collieries, of whom there are more than 8000 to walk out on sympathetic strike, because Wyoming operators are shipping coal into Colorado. This was set at rest by President A. G. Morgan, of the United Mine Workers, who issued a statement that such strike was not under consideration, would not occur, and that it was "impossible," because of an agreement with operators covering wages, hours of labor, working conditions, methods of adjusting disputes, etc., which would not be violated. Eugene Debs is in Denver and according to leaders of United Mine Workers, he is here to urge a strike among Colorado railway employees in sympathy with coal miners' strike. He makes the statement that "Colorado is in the throes of one of the greatest industrial conflicts in the history of the nation, and that a state of civil war exists, though people do not seem to realize it." However, in face of all this trouble, coal dropped 50c. per ton Nov. 20, this reduction being announced by Rocky Mountain Fuel Co. There is an ample supply of coal on hand, and upwards of 400 carloads are standing on railway tracks in Denver, and northern mines are working at full capacity. At this writing the strikers are apparently rapidly losing ground. Steel, railroad and wire mills of the Minnequa plant of Colorado Fuel & Iron Co. were started again Nov. 17 with 8 open-hearth furnaces and about 1200 men have been taken back to work. Soon after commencement of strike output of Colorado Fuel & Iron mines was so curtailed that force at steel plant was reduced from 4000 to about 800 men, but for two weeks now company has been receiving big coal shipments, and sufficient has been stored to run the plant for some time. It had been practically closed for about four weeks.

BUTTE—Nov. 19

Butte & Superior is putting in a Kelly filter press plant for reducing moisture in blende flotation concentrate. At present this contains about 13% water, and having to go to smelters in Oklahoma, whither freight rate is high, there is an expense of about $1 per ton of concentrate for freight on water. It is hoped to make some saving here.

Electric Light and Power Rates hearing before public utilities commission of Montana, began Nov. 13 at Helena. Hearing was on subject of electric light and power rates charged consumers, in Butte, Anaconda, Billings, and other cities in state by Montana Power Co. Company asked for an adjournment of six months in order to complete valuation of its properties, started last July, so that a scientific basis of rate making could be obtained. The day was taken up with testimony of expert witnesses on subject of rates and conditions governing them, and at adjournment it was decided by members of commission that request of company for an extension of six months be decided next day. The following day commission denied this request, stating that whereas it realized that it would be impossible to make an inventory, appraisal, and cost analysis of such extensive properties as those owned by Montana Power Co. in less than six months, yet it believed that certain reductions should be made now in order that people of state should benefit at earliest possible time, and especially during coming winter months when rates are particularly burdensome. It however recommended that company continue in its work of appraisal so that at end, in event that reduction in rates, to be settled upon by commission, should be found unjust, a readjustment might be made. An adjournment of hearing until Nov. 28 was then ordered, at which time a schedule of reduced rates, drawn up by commission, will be given company for consideration.

HOUGHTON—Nov. 22

Secretary Wilson's Speech at Seattle was the chief encouragement given strikers in the Michigan copper country this week. The speech was used quite generally to arouse further enthusiasm in the strikers to maintain their attitude of defiance to the mining companies. Wilson was followed on the same platform by Gompers, Ryan and Walker and other socialist orators who told stories of conditions at Calumet that were retold all over the United States, Associated Press dispatches carrying a 1000-word story on the situation. Notwithstanding that in these addresses palpable falsehoods were made, well known to everybody here in the copper country, the fact remains that the majority of newspaper readers never see the denials that follows such stories, if any do follow, and they believe that men like Gompers and Lennon tell the truth and know whereof they speak. People here, naturally, are indignant at the address of the Secretary of Labor. The explanation of the Gomper's address is that he had to go the limit of socialist doctrine in order to get himself reëlected president of the American Federation. The general effect of the attitude of these various federation leaders is to bring about further contributions to the financial end of the strike from labor-union men throughout the country. With the exception of the clash at the Quincy early Monday morning, Nov. 17, between the strikers and the deputies, in which a striker was wounded by revolver shots, there were no further serious disturbances in the strike zone. Morning parades, which really amount to mass picketing, were held as usual. The quietness prevailing is probably due to awaiting decision of the Supreme Court, which heard arguments in the mandamus proceedings on the O'Brien injunction Tuesday. Preparations for landing imported men continue in Keweenaw County and mines to the north, and probably as soon as ac-

commodations have been obtained, a large force of men will be brought in. Representative McDonald, from this district, has asked for a Federal investigation into the conditions of the copper strike, and what the outcome of this will be is problematic. The Department of Labor sent investigators into the district early in the dispute and made a thorough investigation. The Department asked 110 questions of the companies, covering the entire situation, which were answered in full, and the Copper Country Commercial Club, which comprises about 500 representative business men in the district, appointed an investigating committee, which has rendered an exhaustive report, and it is doubtful if anything new can be brought out. Calumet & Hecla, and Superior are producing normally. Others gradually are coming up to normal. This is being done in spite of all kinds of intimidation. The fact is that the trammers who continue to strike are content to live on the poor food furnished by the federation, and to let their wives and families eke out a bare existence. The extent of their labor is to walk in the daily parade, which they must do to get their order for goods at the federation place of business. These chaps have become so accustomed to loafing that it will be difficult for them to get into the habit of working again.

SALT LAKE CITY—Nov. 20

Salt Lake & Alta R.R. from Midvale to Wasatch and granite quarries in Little Cottonwood cañon was completed, Nov. 15. Several trainloads of granite for new capitol building were sent over line before this date. Granite is being quarried as rapidly as possible, and since opening of railroad working forces have been increased. Line is 11 miles long, and will soon be opened for all kinds of freight and passenger traffic. It facilitates ore hauling from camp of Alta. Rate heretofore has been $2.75 to $3 per ton from mines to railroad cars at Sandy. Present railroad comes to within three miles of lower terminus of Alta tramway down Little Cottonwood, and materially shortens the wagon haul.

Utah Copper Co. Taxes paid to county treasurer, Nov. 15, amounted to $200,000. Payment was made under protest, as there is a question with the county, over method used in determining value of company's taxable property. About $35,000 of the $200,000 is claimed to be in excess of the amount actually due. Suit to recover this excess from county will be filed in federal court in near future, according to letter of protest sent with check. Last year a similar suit was filed, after taxes had been paid, and company won in local court. The county appealed to federal court of appeals, which will meet in St. Paul, and hear the case in April. Until former case is decided, county can collect taxes on present basis of assessment.

DULUTH—Nov. 21

Ore Shipping for the Season of 1913 is practically over, but it will be a few days yet before final and exact statistics of the season's movement will be available. The grand total will not be far from 49,200,000 gross tons, which is about 1,000,000 tons in excess of the shipments in 1912. Earlier in the season the movement seemed to be in a fair way to cross the 50,000,000-tons mark, but later it fell off heavily. Considerable ore that was sold for delivery this year has been carried over for delivery in 1914. As near as can be ascertained the ore movement from Minnesota this year has been 36,565,000[1] tons of the estimated grand total for Lake Superior of 49,200,000 tons. Great Northern reports 13,050,000 tons, Duluth, Missabe & Northern, 12,300,000 tons, Duluth & Iron Range, 10,500,000. The movement from the Cuyuna range is estimated at 700,000 tons, the bulk of which was delivered at the head of the lakes by the Soo Line, and the rest by the Northern Pacific. The latter's dock did not go in commission until August. Great Northern suffered a loss of about 900,000 tons as compared with 1912, owing to the ore dock strike at its Allouez properties last summer. The Steel Corporation shipments this season have been about 23,700,000 tons, substantially the same as during 1912. The new steel and concrete ore dock for the Duluth, Missabe & Northern road, to be known as No. 5, is to be completed earlier than was originally expected. It was estimated when the work was begun that it would be ready for receiving ore in the spring of 1915, but President W. A. McGonagle, of the Missabe road, states that a part of the dock will be ready to go in commission during the autumn of 1914. The foundation is completed, and the American Bridge Co. is now erecting the steel superstructure. The Missabe docks are expected to close Nov. 24, Soo Line dock, Nov. 13, Great Northern, Nov. 29. All the other docks are closed now.

[1]Other estimates give total of 37,465,000 tons, the only discrepancy between these and above figures being in the tonnage ascribed to Great Northern, which is credited with 13,950,000 tons.—Editor.

JOPLIN—Nov. 22

The Issue of Lowering Wages throughout the sheet-ground camps was forced by the decline in ore prices this week and Saturday night saw the announcement of 10% reduction by a large number of producers at Webb City, Carterville, Prosperity and Duenweg. In some cases the reduction was offered as an alternative to closing down the property for an indefinite period so the miners have accepted the cut in order to keep employment. The cut was made with the understanding with the men that with a resumption of normal prices of $45 and over the wage scale would be raised again. It has been the custom ever since 1907 that when ore prices fell to $45 a cut was made and with a further reduction to $40, another cut was made approximating 10% each time. When prices regained their levels, the old wage scale was automatically resumed. During the last few months, however, operators have tried to carry on their old $45 wage scale even with ore below that figure. Most of the mine operators have felt that the low prices would end soon but the long stretch of low prices has discouraged them and the cut was finally announced. In some instances, however, the operators announced suspension of operations till a better price period. While the wage cut has been confined to the sheet-ground areas so far, it is likely to be introduced elsewhere in the district following the announcement today.

BISBEE—Nov. 17

Winter Work in Warren District is well started, and January is expected to see the biggest pay-roll in history of the district. As compared with November a year ago, pay-rolls are at present much larger. Estimates on the larger number of men employed now than a year ago range from 15 to 35%, with the majority opinion favoring the latter figure. It is an excellent class of labor, too, on the whole, particularly so as measured by the best standard to be found in industrial centers, the preponderence of married men. These have constantly increased on the pay-rolls of the Warren district, in the last few years, and the percentage of gain the present year has been marked. It is steadily continuing.

Copper Queen Surface Construction Work now underway is extensive and much new work is being done underground. At the new precipitation plant satisfactory headway is being made. It is noticeable in this connection that preparations have been made in the way of general cleanliness for most any sort of sloppy weather that may come about in the winter season. Of course, as winter weather goes when measured by freezing temperature and blizzards, the Warren district has none of it, but there have been winters in which there was considerable rainfall, though none in which men have not worked out of doors in their shirt sleeves a part of each day at least. Nevertheless, it looks good to see things as shipshape at the beginning of winter as if there was really to be real winter weather, and that is the form they are in here now. Now is the time that men begin to come in from all of the colder climates. Some of them are, of course, not the most desirable of citizens, but with them come many who are good miners and who will remain and become good citizens. During the last few weeks the new arrivals have been noticeable about the streets. The best feature in connection with this and one that tells a great deal about the activity of the district and its prosperity, is that none of these men remains idle who really wants work. Some of them do not care to look it in the face, but those who want employment are going on the pay-rolls, and they are not displacing anybody in doing so.

SILVER CITY, N. M.—Nov. 18

The Organ Mining District 13 miles from Las Cruces has been boomed by the indorsement of the directors of the El Paso chamber of commerce in a resolution recommending the district as "being worthy of investigation." The region is now practically idle, but one with much good property ready for development. The El Paso smelter in years past is said to have bought the bulk of the product of the mines, though much was shipped to Torreon, Mexico. Development has been held back by extensive litigation but this is gradually clearing away, but water was an important factor in closing down some of the lead-silver mines.

VANCOUVER—Nov. 17

A Blast Furnace at Vancouver may be built for production of pig iron provided financial arrangements, at present being carried on in Europe, are successfully terminated. If the furnace is successfully operated rolling mills, etc., will be built. The company which is backed by Henry Hewett & Son, of Tacoma, Wash. and T. D. McFarland, of Vancouver, is to be capitalized at $15,000,000. The syndicate has acquired coal properties in British Columbia in addition to obtaining control of iron deposits. A force of men is opening the iron deposits.

THE MINING NEWS

ALASKA

S. S. "VICTORIA" brought gold to Seattle, Nov. 14, $150,000 from Nome and $107,000 from Fairbanks district.

BENNETT JAMES, of San Francisco, and associates, it is reported, will install a large dredge on Moore Creek, tributary to Kuskokwim.

COAL FROM MATANUSKA FIELD, 900 tons of it, has been mined and sacked, ready for transportation. It is to be tested by U. S. Navy. George Evans, in charge of party, has started cutting a road around cañon of Matanuska River and the big undertaking of transporting the coal to tidewater will be started as soon as snow falls.

MINING IN VALDEZ DISTRICT has made wonderful progress in last few months. While there has been nothing in nature of a boom, work of development has been carried on steadily. Many properties which were considered at best but promising prospects last year have entered dividend list or been sufficiently developed to show merit.

A WINTER RUSH TO CHISANA is predicted by P. C. Collins, traveling passenger agent of Canadian Pacific Ry., who has just returned from Dawson. He thinks from appearance of activity displayed about the mouth of White River that there is going to be a big rush. Old-timers in Dawson believe Chisana will be a big camp, and are preparing to go in as soon as sledging is easier. There is now a roadhouse every 10 miles from the mouth of White River in to diggings. It is significant that several miners are now outfitting for a return who went in to new fields with first rush with barely enough provisions for the trip in and out again, and who reported adversely on their return.

PRIMROSE—New strike has been made on this property near Lake Kenai. New drift is 8 ft. wide, and shows rich gold ore.

BIG FOUR (Valdez)—Robert Martin was killed and John Connelly, Warren Nelson and E. S. Bruner were injured in an avalanche on these claims at Mineral Creek. One of the men was under snow and dirt for seven hours. The men were caught without warning and carried to within 10 ft. of a precipice. Brunner chopped his way out with a piece of whiskey flask and rescued his companions.

ARIZONA

Mohave County

COPPER GIANT (Hackberry)—It is stated that sinking shaft below 300-ft. level will soon be resumed.

GOLCONDA (Golconda)—Company is shipping regularly to smelters at Bartlesville, Okla. Ore is hauled from Golconda to railway in auto trucks.

TENNESSEE (Chloride)—Three cars daily are being shipped from old tailings dumps to mill at Needles; company is also shipping two cars of raw ore.

CHAMPION (Chloride)—McDonald & Co., have taken lease on mine and will jig ores from dumps, with jigs from Tennessee mill. Considerable ore left in mine will also be put through jigs.

GOLD ROAD (Gold Road)—A recent weekly bar was valued at $20,000. There have been two deaths during last few months from electric shock, so changes are being made in wiring and equipment and lead-covered cable has been ordered.

MAY BELLE (Kingman)—Long crosscut has reached May Belle vein which is 6 ft. wide at this point assaying $49 in gold, 7 oz. silver. Crosscut is to be continued quite a distance further to cut large, rich lead vein which shows in shallow workings.

BI-METAL (Kingman)—For three weeks A. B. Richardson, of Tucson, representing Mines Co. of America, has been sampling this property. Property is on both sides of Santa Fé R.R. and apparently contains a large body of low-grade ore. It is stated that ore assays about $4 per ton in gold and silver.

NIL DESPERANDUM (Vivian)—A company has recently been organized by H. E. Woods and F. M. Woods to develop this and several adjacent claims which have been purchased by California Southern Oilfields Co. Property is south of Leland-Mitchell group. Some of the richest specimens ever found in the county have been taken from this property on which but little development work has yet been done.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—Mr. Overstrom, designer of new mill, has been at property for several weeks making changes and adjustments in concentrating tables, classifiers and other equipment. Mill has had several trial runs and latest report is that it is working satisfactorily and turning out high-grade concentrates. Company is now making an effort to secure a larger supply of water, quantity now available being inadequate for continuous operation of mill at full capacity.

Yavapai County

COPPER CHIEF (Jerome)—It was reported some time ago that the Guggenheims had taken over this mine. Report is still in circulation as some of the Guggenheim engineers who made extensive examinations of property last spring were recently making further examinations, and it is said now that they expect to start further development with a large mining force in near future.

EQUATOR (Jerome)—It is general belief that W. A. Clark who operated this mine a few years ago, will resume operations in near future. Property has produced about $1,500,000 and it is said that it was shut down for lack of transportation and smelting facilities. Since starting erection on new custom smelter at Clardale it is said that ore from this mine can be used to good advantage in smelting works. Railroad survey has been extended from Clarkdale to the Copper Chief which adjoins Equator.

UNITED VERDE EXTENSION (Jerome)—This mine locally known as the Little Daisy, has completed connection in Douglas shaft with East drift on 800-ft. level from old shaft. A rerord in sinking in this distrirt has been made. A winze was sunk in this East drift 200 ft. and then a drift was driven back under ore encountered above in 800-ft. drift. Driht is also being driven from this winze to connect with Douglas shaft which will be sunk 1600 or 1800 ft. deep. New electric hoist is working well.

CALIFORNIA

Amador County

KENNEDY (Jackson)—Compressed-air hoist at winze on 3400-ft. level failed to work Nov. 12 just as skip carrying Superintendent Webb Smith and four miners had reached station. Skip dropped, but engineer quickly regulated speed so that at 150-ft. point below station skip was brought to an easy stop. Men were uninjured except for bruises and sprains, which were not serious.

ARGONAUT (Jackson)—North reel of electric hoist was temporarily put out of commission, Nov. 13, by accident to skip and cable. An axle broke and caused skip to lodge in collar of shaft as skip was being lowered. Darkness prevented engineer from seeing that cable was piling up about gear of hoist. Gear was badly broken before motor was stopped. South reel and gear were not affected, and work proceeded through south compartment of shaft. No one was injured.

Butte County

NATURAL GAS at a depth of 110 ft. was found in well driven for irrigation water on G. J. Lohman ranch west of Oroville. Later well filled with water. Well will be deepened to 500 feet.

Calaveras County

STATE HIGHWAY ROUTE connecting Sonora with main trunk line has been determined as far as Oakdale. Bids for construction will be called for at December meeting of State Highway Commission.

EASY BIRD (Mokelumne Hill)—Preparations are being made to reopen mine by deepening shaft. Stamp mill will be overhauled. Corral Flat Mining Co. has an option.

Fresno County

MOVING PICTURES are being prepared of underground and mill operations in Randsburg district.

EIGHT TUNGSTEN CLAIMS located by Frank Feldman and others of Randsburg, in Kelso mining district, 55 miles northwest of Randsburg, have been taken over on purchase option by Colorado men. Mill is being built and four-mile pipe line is being laid. Cropping of sheelite reported 7 ft. wide on surface. Ore contains tungsten, gold and silver.

PACIFIC (Dos Palos)—New vein of cinnabar disclosed by recent exploration, is 14 ft. wide and carries 1% ore.

ROBERT GROUP (Atolia)—Development progressing on four claims. Strong showing of tungsten reported. Three shafts 80 and 60 ft. deep have been sunk.

Merced County

ORIGINAL (Merced)—Recent rain at lower elevations and snow in mountains insures water for resumption of milling. Large amount of ore has been mined.

Placer County

EXCELSIOR MINING CO. (Forest Hill)—Retimbering Baltimore tunnel is in progress and new mill is being built.

BELLEVUE-BULLION (Ophir)—Electric-power plant is being installed and new stamp mill is under construction.

Shasta County

BALAKLALA (Coram)—Work on installation of gas plant in connection with Hall desulphurizing processes in progress. Commercial demonstration of Hall process expected in latter part of December.

BAKER (Ingot)—Installation of a gasoline hoist is completed and sinking shaft to 200 ft. has been started. This is a zinc-copper property recently taken over by Utah men. Shipment of ores to Utah for smelting is contemplated.

Siskiyou County

CARLOCK GOLD MINING CO. (Fort Jones)—Property consisting of 10-stamp mill, rock crusher, pumps and other machinery has been purchased by C. A. Reichman, of Fort Jones. Mine, which has produced about $400,000, will probably be reopened.

Yuba County

CONSOLIDATED WILLOW MINING CO. (Marysville)—Suit has been brought by George W. Lister and others against directors for an accounting. Stock to amount of $130,000 was sold and complaint alleges only $20,000 expended on property. Superintendent and directors are charged with conspiracy to defraud corporation. Property is at Weeds Point, Slate Range township, and consists of patented placer claims and ditch.

COLORADO

Clear Creek County

W. J. CHAMBERLAIN ORE CO. (Idaho Springs)—During October, company purchased ore to amount of $47,000, $12,000 more than for September. October was best month since 1908.

VIRGINIA CITY—Development is in progress on this Lincoln Mountain property; 40-oz. silver ore is being mined from development and shipped to independent smelters at Salida. In addition to smelting ore, considerable low-grade milling ore has been opened up.

LITTLE MATTIE—A shaft was recently sunk 200 ft. from tunnel level. West drift from bottom of this shaft has opened a 7-ft. vein of smelting ore. Returns from trial shipments indicate $120 per ton. West drift is now over 200 ft. long and during this advance vein has widened from 1 to 7 ft. and appears to be improving as work proceeds. It is reported that value of shipments from this property to local sampler during month of October, amounted to $30,000. Low-grade ore from mine is being treated in company's 100-ton concentrator on Chicago Creek. Concentrates are reported to be worth $80 per ton.

Gilpin County

GOLDEN FLINT—This mine in Perigo district, northern Gilpin County, now has in operation a new 175-ton mill, process being amalgamation concentration and cyanidation, saving effected being said to be from 90 to 92%. There is enough ore in sight to keep mill running for a year at full capacity, and development will be kept ahead of extraction.

Gunnison County

GOLD LINKS (Ohio)—It is estimated that recent years' production has been between $600,000 and $780,000.

CARTER MINING CO. (Ohio)—Four-compartment raise is up 960 ft. The 1000-ft. station will be cut and then driving 130 ft. will reach the bottom of old Volunteer shaft.

San Juan Region

JUNTA CONSOLIDATED (Telluride)—Tramway and mill are nearing completion.

BUTTERFLY MILL (Ames)—Twenty-five stamps are dropping with plenty of good ore ahead.

BALLARD (Telluride)—Mill is up and ready for a trial run and is only waiting finishing of a two-bucket tramway to begin production.

CARRIBEAU (Ophir)—The mine and mill which started up last month have already shipped two carloads of concentrates. A compressor is being installed; machine drills will be used.

Teller County

STRATTON'S ESTATE (Victor)—In American Eagles mine a new oreshoot has been opened at 1000 level by sublessees.

CRESSON CONSOLIDATED CO. (Cripple Creek)—Company has purchased Maggie mine on Raven Hill, credited with production of $250,000 from workings not over 600 ft. deep.

IDAHO

Cœur d'Alene District

A BOOM IN LEASING is expected in Wardner, due to arrangements just completed with Bunker Hill company. Old east mill will be at service of all lessees. Ore will be sampled as it comes to mill and lessees will be paid for their ore on basis of this sampling, which will remove necessity of maintaining separate bins. All ore can now be delivered for hauling at county road, the two leases working above this road now having tramways in operation. Wretched condition of road has caused no little difficulty in getting ore to mill at Kellogg. Caterpillar engine is only thing which is making two-mile trip regularly. With roads in first-class condition output could be doubled.

SONORA (Burke)—John H. Moffat, original owner and locator of this property, has undertaken for a stock consideration to find faulted part of vein.

FEDERAL (Gem)—New 300-ton mill at Frisco property will be in operation by first of year. A crew of 32 men now has framework practically completed and interior work is well along. Mill will have two floors, each of which will be 126x144 ft., and equipment will include Hardinge mills for fine grinding, and Franz tables exclusively. These tables were invented and are manufactured in Wallace. An incline is to be built to haul ore from mine to mill.

MICHIGAN

Iron

MANSFIELD (Mansfield)—Oliver Iron Mining Co. has a small force of men employed at this property removing machinery as lease has expired and will not be renewed. Mine is about played out and it is not believed that it will ever be worked again.

BERKSHIRE (Iron River)—A new shaft is being put down on this property and it is quite likely that when work is completed mining work will be resumed. Property has been idle for several months because of new work that had to be carried on and because only a small part of ore in stock was sold. A new compressor house will be built at property; foundations are about completed.

CLEVELAND-CLIFFS IRON CO. (Gwinn)—Steel is now on the ground for headframes to be erected at Mackinaw and Gardner properties and concrete foundations have been put in. Shafts were sunk to ore over a year ago but no work has been carried on at either place since. Work of sinking has been started again and mines will probably be ready to enter producing class next summer.

BALKAN MINING CO. (Alpha)—Shaft has reached ore. Considerable difficulty was experienced in getting shaft started as there was a band of quicksand to go through and a large volume of water had to be taken care of. When a depth of 100 ft. is reached first drift will be started to ore which lies 130 ft. south of shaft. Part of property will be stripped and mined as an openpit and bids for work have been called for. Bids were submitted several months ago but all were rejected.

LAKE ANGELINE (Ishpeming)—This property, owned by Jones & Laughlin Co., laid off a part of its force last week because mine is about exhausted, only a few drifts now being worked. Mine is now being worked with only a few men and it will not be long before it will be found necessary to suspend all operations. Company is getting ready to open up its Iron Mountain Lake property, a road from Ishpeming now being constructed. Just when work of putting down shaft will be commenced is not known but condition of iron market will probably settle this. Many men now employed at Lake Angeline will probably be transferred there when work is started.

MINNESOTA

Cuyuna Range

RAILROAD EXTENSIONS— Considerable activity is shown in Cuyuna district by both Northern Pacific Ry. and Soo Line, which roads absolutely control Cuyuna range ore shipments. Minnesota & International Ry., a Northern Pacific subsidiary, has just completed the Leaks cutoff into Brainerd. Cuyuna Northern Ry., another Northern Pacific subsidiary, is contemplating, it is said, a track along south shore of Rabbit Lake to Roger-Brown Ore Co.'s timber shaft at Kennedy mine. Duluth-Brainerd Mining Co. has signed an agreement with Northern Pacific for a spur into its property in Sec. 32, 47-29, which line will start near Ironton, a total length of three to four miles. Soo Line has completed its six-mile extension westward to Rowe hydraulic operation of Pittsburgh Steel Ore Co. at Riverton, and is working on extension to Iron Mountain mine. In the scramble for tonnage on Cuyuna range, Soo Line appears to have had the best of it up to present, controling tonnage from Armour No. 1 and No. 2, Kennedy, Pennington, Iron Mountain, Thompson and Rowe mines, while Northern Pacific gets ore from Cuyuna-Mille Lacs, Cuyuna-Duluth, Brainerd-Duluth, Adams, Barrows and Brainerd-Cuyuna mines. Methods employed by two competitors in obtaining this profitable 100-mile haul to Superior docks are radically different. Northern Pacific through its subsidiary, Northwestern Improvement Co., has taken an active part in actual exploration of district, and owns in fee or by lease an immense tonnage of ore, which later on will result in a great deal of business for railroad. Plan is to sublease ore deposits, with a clause providing that all ore be hauled via Northern Pacific to docks. Soo Line, so far as is known, controls no mineral land in district, but is extremely active and aggressive and has many influential friends, with whose aid, up to present it has been enabled to secure bulk of tonnage hauled during past seasons.

U. S. STEEL CORPORATION—Officials of company visited Cuyuna range last week, among them being D. G. Kerr, vice-president; W. J. Olcott, president, and John U. Sebenius, chief mining engineer of Oliver Iron Mining Co. Several years ago Steel Corporation withdrew from Cuyuna range entirely, and present visit has some significance, due to recent encouraging developments on range.

Mesabi Range

ADVERSE WEATHER CONDITIONS are resulting in 1913 ore shipping season closing sooner than had been anticipated. While this year will exceed all previous years, excess will not be great. Week before last many large producers suspended shipments, including Mahoning, of Mahoning Ore & Steel Co., Mesabi range's largest pit; Myers & Winifred, of the Steel Corporation; Stevenson pit, of Corrigan-McKinney & Co.; Leetonia, of Jones & Laughlin; Shenango, of Shenango Furnace Co.; La Rue, and Hanna, of M. A. Hanna & Co.; Scranton, and Albany, of Pickands, Mather & Co.; Laura, of Inland Steel Co.; and La Belle, of Pitt Iron Mining Co. With exception of Pickands-Mather's Utica mine, it is likely that not a mine on the Mesabi will be shipping so iate as Dec. 1. At Virginia, Jones & Laughlin Co. are preparing to strip Columbia property, which adjoins business district of city. All buildings are being removed, and stripping operations will begin by Jan. 1. At Biwabik, it is said that U. S. Steel interests expect to strip Higgins property during coming year, although no official announcement has been made. Incident to curtailment of operations on the range, pay rolls are being reduced, and floating population is undergoing its annual transition from miner to "lumberjack." During winter months, laborers go to logging camps, and at Hibbing alone fully 3000 men will be given employment in logging until cold weather breaks up in spring.

MISSOURI-KANSAS-OKLAHOMA

Joplin District

A TRIPOLI DEPOSIT is being developed by Edward M'Conkey, on his farm near Baxter Springs, Kan. He believes 100,000 tons are accessible and has arranged to market it in the rough.

DRILLING OPERATIONS AT BUTTERFIELD, MO., show orebodies sufficient to indicate new zinc field will be opened up. Joplin men have taken leases and are prospecting. Ore is found from 108 to 130 ft., average being about 4 per cent.

MONTHLY FUND OF $1000 is being pledged to prevent threatened shutdown of Providence Mining Co.'s pumps at Webb City, Mo.; 20 big properties being affected. Providence company demands this financial aid to meet expense of draining tract, which lies in North Webb City field, and no other adequate pumping facilities are available. Operators believe appropriation will be raised, as heavy producers would be compelled to cease operation within short time.

GOPHER (Duenweg, Mo.)—Good outputs are made weekly. Ore is found in sheet-ground formation and mill recovery is large.

POCATELLO (Thoms Station, Mo.)—Concentrator made its initial run last week. It is of 150-tons capacity. Two shafts and several drifts are producing ore.

SKY LAND (Miami, Okla.)—Fair ore has been encountered by the drill from 140 to 200 ft. Lease is held by Franklin Smith and George Bock, of Joplin.

PLYMOUTH ROCK (Sarcoxie, Mo.)—John M. Malang has taken a lease and started drilling. Property lies near Church farm, which also is to be leased and prospected.

MONTANA

Butte District

BUTTE MINERS' UNION WON SUIT brought against Miners' Union, of Lead, S. D., to recover two loans made during Lead strike in 1910. According to decree of court, about $30,000 is coming to Butte Union and about $10,000 to Western Federation. To secure payment of loans, a mortgage was taken on a six-story business block owned by the Lead Union at the time. It was the fight over legality of mortgage that has just been decided. Building is now tenantless, and it is doubtful whether an amount covering mortgage can be realized from its sale.

BARNES-KING (Butte)—Failure of Congress to make appropriation to maintain state assay office is going to cause considerable inconvenience and some annoyance as bullion has now to be sent to Denver, which is the nearest office, and means a delay of 10 days or two weeks in getting returns. This company was formerly always in a position to give out its earnings for the month a few days after opening of next month, but the October bullion had to go to Denver, thus delaying settlement time.

TUOLUMNE (Butte)—At request of some stockholders a complete audit of books and accounts has been made by J. P. Callan. Report, which covers a period of five years, gives detailed statement of operating expenses and receipts during period. It appears that dividends amounting to more than $375,000 have been disbursed in that time. Liabilities, outside of $800,000 of stock, amount to $16,682. Callan criticized expenditure of over $36,000 for legal expenses and recommends curtailment of legal and other expenses in future.

ELM ORLU (Butte)—Perfected water system in the new zinc mill will cost, it is said, about $100,000. Water will be brought to mill through 12-in. pipe a distance of two miles, a pumping station having been established at source of supply. A high-pressure pump connecting with fire hydrants will be put in for fire purposes and about mill there will be a complete automatic sprinkling system. Capacity of water system will exceed 1,000,000 gal. per day. An electric railroad has also been built and arranged so that it has connections with the five railroads running in and out of this city, and with the street-car lines. Progress now being made with construction of concentrator leaves little doubt but that it will be ready for operation early in the spring.

ANACONDA (Butte)—Federal court will not hear case of minority holders of Alice company against Anaconda company until next February. An effort was made to have case set for trial, but at instance of Alice protestants there was an objection on ground that one of the persons needed at hearing was ill and unable to be present. Judge said that he would not be able to take case up until February term of court. There is said to be a desire on part of Anaconda company to have questions involved as to legality of sale of property and right of Alice stockholders to sell property without unanimous consent, settled in order that mining operations may be resumed. Months ago it was understood that work would be started in Lexington mine which adjoins Alice and which it is understood is now controlled by John D. Ryan, but it has since been deemed inadvisable until matters in connection with the Alice are settled. J. H. Gillie and R. H. Sales, general manager and chief geologist, respectively, for company, have just returned from inspection of company's newly acquired copper property in Flathead Reservation near Kalispell, Mont. They report having made arrangements for extensive development of property which promises high-grade copper ore with fair silver. Buildings are being erected for miners and three shifts will be put to work immediately. In order to cause as little delay as possible in mining operations during certain times in winter months when weather conditions make it impossible to ship ore steadily to works at Anaconda and Great Falls, or freezing of ore in cars makes it slow and difficult to unload them, the company has for some time been increasing the ore-bin capacity at a number of its larger and more important mines. With this work completed it will be possible to store in these bins about 50,000 tons of ore, so that when traffic is suspended for any reason mines will be able to keep in operation at full capacity for two or three days at least, instead of either closing down or curtailing output, as has been necessary in the past when such conditions arose. Properties where these improvements have been completed or are now under way, are Mountain View, Badger State, Anaconda, Neversweat, Tramway, Berkeley, West Gray Rock, Stewart, Original and Modoc. Plans have also been made for a similar addition at Bell and Diamond mines, but it has not been decided how soon this work will be commenced. Robert Emmet lode claim, southwest of Gagnon mine, and south of Gambrinus claim of Corbin Copper Co., has been acquired.

Lewis & Clark County

PIEGAN-GLOSTER (Marysville)—Since recent return of C. W. Goodale, president of Barnes-King Mining Co., from an inspection of this property in Marysville district, it has been decided that only a small force of men will be employed during winter. A raise has been started from Norman tunnel at west end of mine, and this will be continued through to surface for development purposes and for ventilation. Assessment work will be done on several unpatented claims in group.

Madison County

PYRAMID (Virginia City)—It is reported that three Nevada mining companies are negotiating for purchase of this company's mines at Pyramid Lake. Mason Valley Copper Co. is one of the prospective purchasers.

Powell County

EMERY (Deer Lodge)—An English syndicate represented by Charles Herzig, of Butte, has leased and bonded this mine from present owners of lease, Higgins & Gruwell, of Butte. Corporate name of syndicate will be Butte Daryumsu Co., Ltd., of London. Mine has produced in years past a large amount of ore but was forced to shut down. Present company is a strong concern financially and it is expected that a large force of men will be put to work at once.

NEVADA

Churchill County

A GOLD-SILVER DISCOVERY has been made near the old Bayfield mine in the I X L district.

Comstock Lode

CHOLLAR LEASING CO (Virginia City)—Large tonnage is being broken in glory-hole workings.

MEXICAN MILL (Virginia City)—Ore from Monte Cristo mine is being treated.

COMSTOCK PHOENIX (Virginia City)—Ore is being stoped on 550-ft. level and regular shipments are made to mill.

CONSOLIDATED VIRGINIA (Virginia City)—Southwest drift from northwest crosscut on 1000-ft. level is being driven. Flow of Water from face has ceased. Repairs to shaft and airways are being made.

Humboldt County

CASEY JONES (Rochester)—A 3-ft. vein of silver ore was recently discovered on this fraction.

BIG FOUR (Rochester)—It is reported that an oreshoot carrying free gold has been struck in south drift at a point 300 ft. vertically from surface. This is the first free gold found in property.

TOMBOY (National)—This group of 12 claims on Buckskin Mountain will be operated by a company which will incorporate in near future. A tunnel, now in 400 ft., has cut a 4-ft. vein of gold ore.

Lyon County

SMITH VALLEY MINES CO. (Smith Valley)—Rich gold-silver ore is being sacked for shipment.

CAPITOLA (Loma)—A shaft is being sunk. Good grade of gold ore is now being mined.

BLUE BIRD & AURORA (Yerington)—A lease has been granted on this property for one year. Ore has been shipped steadily for the last 18 months.

MONTANA-YERINGTON (Yerington)—An option on this property, formerly operated by George Wingfield, has been given to Mason Valley Mines Co.

BLACK COPPER (Yerington)—It is reported that this group, north of Montana-Yerington, was sold recently. A shaft will be sunk and a hoisting plant installed.

EMPIRE-NEVADA (Yerington)—Lessees have struck the shoot of good-grade ore lost in the Smith Bros. lease. Regular shipments from this and other blocks under lease are being made.

BURLINGTON-NEVADA (Yerington)—Shaft is being retimbered preparatory to further sinking; new hoisting plant will be necessary. On 180-ft. level an oreshoot assaying 12% copper has been opened.

BLUE JAY (Yerington)—Pipe for the air line from the New Yerrington compressor plant has been received. As soon as this line is in, air drills will be installed. Development on the 200- and 400-ft. levels is in progress.

MASON VALLEY MINES CO. (Thompson)—Ore receipts for week ended Nov. 13, 1913, were as follows: From Mason Valley mine, 2167 tons; from Nevada-Douglas, 1353 tons; from other mines, 763 tons; total, 4282, or a daily average of 612 tons. Five cars of matte were shipped.

McCONNELL (Mason)—A raise is being driven from the 200-ft. level in the shaft to connect with the upper workings, and is in ore all the way. Drifting on an oreshoot on the 200-ft. level, which was partially developed by former operators, is being done. In the lower levels considerable copper ore is being found which closely resembles the "spot" ore of the Nevada-Douglas mine.

Mineral County

NEVADA CHAMPION COPPER CO. (Luning)—A hoist has been installed and shipments are being made.

MAYFLOWER (Luning)—Operation is now being carried on through the tunnel, and shipments of good-grade copper ore are being made.

SHIPPER COPPER CO. (Luning)—Shaft has been sunk to 300-ft. level on which good-grade copper ore has been developed. Shipments are being made.

WAGNER AZURITE COPPER CO. (Luning)—Incline shaft has been sunk to 100-ft. level, and crosscut will now be driven to vein. At 50-ft. level crosscut has been driven 50 ft. to vein, and drift has been driven 60 ft. to north in ore.

QUALEY (Mina)—Copper ore of good grade, carrying some gold and silver, has been cut by two tunnels at depths of 500 and 750 ft.; upper tunnel cut vein at 1000 ft. from portal and lower tunnel at 1600 feet.

Nye County

TONOPAH PRODUCTION FOR OCTOBER was as follows: Tonopah Belmont, 15,233 tons; Tonopah Mining, 15,043; Tonopah Extension, 5019; Montana-Tonopah, 4878; West End, 4455; MacNamara, 2517; Jim Butler, 1646; Merger, 1695; North Star, 285; Halifax, 250; Midway, 200; total, 51,221; total gross value, $1,029,245.

PIONEER CONSOLIDATED (Pioneer)—Mill is being completed and a pipe line 2¼ miles long through which water for mill will be pumped is also nearly finished.

MUSHETT & WITTENBERG (Manhattan)—Company has purchased 10-stamp mill and sampler of Manhattan Milling & Ore Co. and has secured Brady lease on Union No. 9. A four-year lease and bond on Big Pine has also been taken. A shoot of ore averaging $9 has been developed in Big Pine and a large tonnage of ore assaying $7.50 has been developed in Gold Crater claim.

Washoe County

RENO-PEAVINE (Reno)—Headframe is completed and a gasoline hoist has been installed.

TWIN METALS (Summit)—Shaft is being enlarged and retimbered. Ore broken in work is being shipped.

OREGON

Baker County

COLUMBIA—All arrangements for winter work and no shutdown, no matter how deep the snow gets, have been made.

Josephine County

ROGUE RIVER BANKS AND BARS have recently been thoroughly prospected by men who contemplate putting in a dipper dredge. They seem satisfied with the results of their investigations, which reached from Grants Pass to Galice.

GOLD RIDGE—This quartz mine, recently sold by T. M. Anderson, to Eastern men, will soon be equipped and developed.

ALMEDA CONSOLIDATED MINING CO. (Galice)—Superintendent John Ross is making tests to determine what type of concentrator will be best suited for ore. Water is being pumped out of the different shafts getting ready for operations on a large scale.

SOUTH DAKOTA

Lawrence County

GOLDEN REWARD (Deadwood)—A large portion of the ore supply for mill at Deadwood is coming from lessees who are operating at various places on property in Bald Mountain and Ruby Basin district.

RATTLESNAKE JACK (Galena)—A 10-stamp mill and cyanide plant is being built on this property, adjoining the Gilt Edge-Maid. Plant will be operated by electricity throughout. It is expected to be in operation before spring.

HOMESTAKE (Lead)—All of brickwork has been completed, and last portion of roof is being finished on Recreation Hall. Steam-heating plant has been installed, and is working. Plasterers have commenced, and it is planned to finish building this winter.

MONARCH (Two Bit)—A car of $75-ore was recently loaded for shipment to the Omaha smelter. Property is being worked by Nickoli Bros., lessees. Oreshoot is narrow, and, although production is small, a good profit is made. There is a large amount of milling ore on dump.

NEW RELIANCE (Bald Mountain)—Several thousand feet of diamond drilling is to be done on this property in few months. Mill is running steadily, and in addition to company ore is treating a small tonnage for P. H. Bertschy, who is leasing on Imperial ground, adjoining.

TROJAN (Trojan)—Cyanide plant is operating steadily at full capacity, 275 tons daily. Good progress is being made installing new equipment, which includes thickeners, storage tanks, etc. A tube mill will also be installed. New machinery will effect an increase in capacity of at least one-third.

HEIDELBERG (Two Bit)—Property is showing up well under development by Deadwood Business Club. Recently a 3-ft. vertical of $20 ore was uncovered in main tunnel. It is now proposed to sink to explore this shoot at depth. Ore is being piled on dump which will be shipped as soon as new, soft roads freeze.

UTAH

Juab County

DRAGON (Silver City)—It is expected that new pumping plant on 800 will be ready for operation in near future. This will furnish water for Knight mill.

IRON BLOSSOM (Iron Blossom)—Fissure opened a short time ago on 500 level, and parallel to main ore-bearing fissure has been cut on 600, where it is 10 ft. between walls, and carries low-grade ore. On 500, shipments are being made from same vein. Development work is being done in southern end of property.

Salt Lake County

U. S. SMELTING, REFINING, MINING—Regular quarterly dividend has been declared, payable Dec. 15.

OHIO (Bingham)—Management has been accepted by G. F. Waddell, who takes charge Dec. 1. It is stated that Mr. Waddell will give much attention to milling operations until these have been simplified.

UTAH COPPER (Bingham)—During October, 10,263,575 lb. copper were produced as compared with 11,817,428 lb. during September, a decrease of 1,580,853 lb. The decrease is due principally to the lower grade of the ore. The tonnage treated was practically same as during September. Operations are on a normal basis, variations occurring in production, owing to change in grade of ore from time to time.

UTAH APEX (Bingham)—Quarterly report for period ended Sept. 30, shows net profits amounted to $48,752, as compared with $83,198 for quarter preceding. Difference in earnings was caused by difficulty experienced in having necessary tonnage accepted by smelter. Smelter notified company that it was unable to handle as large a tonnage as shipped during preceding quarter, on account of ore being unoxidized. Mine was closed for several days, and since shipments were resumed, it has been necessary to keep output down to about half usual production. Development work is being continued on same scale as heretofore. During quarte,r company retired $52,000 worth of bonds, leaving $137,000 still outstanding. Receipts for quarter were $187,164; total operating expenses and development were $132,851; interest on bonds, $5560.

Summit County

PARK CITY SHIPMENTS for week ended Nov. 14 amounted to 3,255,040 pounds.

SILVER KING CONSOLIDATED (Park City)—High-grade silver-lead ore is being mined from above 1500 level, from a part of orebody cut in sinking shaft.

ONTARIO (Park City)—The raise from 1500 is still in ore, mostly second-class, with bunches of first-class. Workings are within about 25 ft. of old 1200-ft. level stopes.

AMERICAN FLAG (Park City)—Operations have been resumed after a short shutdown, while repairs were being made. Colorado stockholders have recently been inspecting conditions at property.

WASHINGTON

Lincoln County

CRYSTAL (Miles)—Operations are to be resumed at once under direction of M. H. O'Connell. Mine has been closed for some time, and it is estimated it will take two weeks to clear it of water.

Okanogan County

ALDER (Twisp)—It is reported that this company is considering an offer of $1,350,000 for its property. A large tonnage of ore is now blocked out ready for shipment.

Stevens County

BLAND (Chewelah)—Company has been organized by G. M. Edwards, of Spokane, and others, for development of a gold property. Operations will begin at once.

CANADA

British Columbia

LONE STAR, AND WASHINGTON (Greenwood)—British Columbia Copper Co. is building concentrator near Boundary Falls to get rid of excess of silica in ore.

SILVER KING (Nelson)—Substantial camp buildings have been erected and mine has been equipped for regular operation. Consolidated Mining & Smelting Co. operating the property.

Ontario

COBALT SHIPMENTS for October were: Alladin, 32.09 tons; Coniagas, 80.93; Cobalt Comet, 56.70; Cobalt Townsite, 112,35; Cobalt Lake, 63.73; Hudson Bay, 43.36; Kerr Lake, 93.32; La Rose, 294.17; Lumsden, 20.00; McKinley-Darragh, 292.12; Nipissing, 131,42; Peterson Lake, 34.61; O'Brien, 119.55; Trethewey, 20.00; Casey Cobalt, 25.86, total, 1423.11 tons.

CROWN RESERVE (Cobalt)—Company is understood to be negotiating for control of Lumsden mine.

HURONIA (South Porcupine)—Ten-stamp mill has been completed and is now in operation. Property is short distance from Larder Lake.

BURNSIDE (Swastika)—Operations on this property have been discontinued due, it is believed, to lack of funds. It is stated that property will be diamond drilled.

NORTH THOMPSON (Schumacher)—Property adjoining McEnaney has been optioned to Associated Gold Mines of Western Australia, which is one of the operating companies of Erlich & Co., of London, England.

KERR LAKE (Cobalt)—Extension of east main vein which was found by unwatering lake, is one of the most spectacular surface showings ever seen in Northern Ontario. Vein has been trenched for 200 ft. and averages about 7 in. silver ore.

WETTLAUFER (Cobalt)—Matter of applying part of remaining funds of company toward purchase of new claims recently came up for discussion and was favorably received by directors. Final action will be taken at annual meeting to be held in January.

CHAMBERS-FERLAND (Cobalt)—Contract has been entered into with Northern Customs Concentrator for use of 30 stamps for a period of five years, which will mean that approximately 100 tons of ore per day will be treated. Mill will not be in operation until early part of new year.

ELDORADO (South Porcupine)—An effort is being made to resuscitate this property which has been closed down for some time, and a meeting has been called to ratify a bylaw to increase the capitalization to $1,000,000 and to take necessary steps for financing operations. Company at present is in debt.

HOLLINGER (Timmins)—Although it is reported that the four-weekly dividend will be increased from 3% to 5%, this report is not generally credited, but it is altogether probable that a bonus will be paid before the end of year. Present rate of production is hardly sufficient to justify an increase in regular dividend rate.

DOME LAKE (South Porcupine)—A deal has been closed for purchase of 200,000 shares of treasury stock and a certain proportion of vendors' shares, at approximately 25c. per share. Deal was put through by C. L. Sherrill of Homestake Mines Finance Co., of Porcupine who is also a director of Hudson Bay Mines Co., of Cobalt. Property will be operated by Hudson Bay Co.

MEXICO

Sonora

SUBLIMA (Nacozari)—A boiler and pump are being installed to unwater shaft so that work can be started below water level where best ore occurs. J. M. Archuleta is owner.

SAN DIEGO (Nacozari)—A new shaft was sunk on this property to tap vein which had faulted in old shaft and has been encountered on 50-ft. level and shows richer than in old workings. First car has been sent to Nacozari and others will follow shortly.

MANZANAL (Cananea)—S. M. Greenidge, of Douglas has secured a lease on this property and will commence work at once. Work will be in charge of A. R. Dickson, one of the owners of Washington mine in the Moctezuma district, and about 20 men will be employed. Mine is about 20 miles south of Cananea.

SANTA ROSA (Cabullona)—Brown & Englant, who have leased all properties in this district of James Kirk, of Cananea, have cleaned out most of the old workings on property and nearly all show shipping grade of ore and men are being put on as fast as room is made for them. One car of 14% copper ore is now at smelter at Douglas and shipments will amount to about 200 tons during coming month.

SWAMP ANGEL (Cabullona)—First shipment from this new property has been sent to smelter and runs 63 oz. silver and 52% lead. Mine is six miles east of Cabullona and ore encountered in shaft at 60-ft. level varies from 6 in. to 2 ft. F. J. O'Neill owner of property has gone to New York to make arrangements to put in a modern plant as now he can only ship about 50 tons per month.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Nov. 26

The metal markets generally have been quiet and rather heavy. Prices are generally lower, and the tendency is downward just at present.

Copper, Tin, Lead and Zinc

Copper—The market has been dull and weak. The leading producer, which named a nominal asking price toward the end of our last week abandoned it and since then apparently everybody has been soliciting business at concessions, and offers to sell at 14¾c. delivered, usual terms, have been general. Even though considerable concessions below that price were made, very few orders were forthcoming. On Nov. 22 and 24 the market was disturbed by offers of speculators to domestic consumers of January and later copper at 14½c. and 14¼c., cash, New York. There was some improvement in business reported by producers on Nov. 25 and still more on Nov. 26, when some fair quantities were disposed of, especially to Europe. Some other evidences of increased interest on the part of buyers over there created a better tone in the market here. Domestic consumers continued in the main to be apathetic.

The situation in Lake copper has remained unchanged. The leading producer has not yet named any price so far as has been reported.

Casting copper has been freely offered at 14¼c., delivered, including freight charges, etc., amounting to 0.15c. The pressure in this kind of metal is explained by the accumulation of unsold stock.

At the close we quote electrolytic in cakes, wirebars and ingots at 14½@14⅝c. Casting copper is quoted nominally at 14.05@14.15 cents.

The London standard market, which on Nov. 20, was £67 10s. for spot and £66 5s. for three months, declined £1 on Friday and a further £1 on Nov. 24, on which day spot was £65 and three months £64 2s. 6d. On Tuesday there was considerable bear covering, and the market advanced to £66 7s. 6d. and £65 7s. 6d. respectively. On Nov. 26 sentiment improved and the market closes firm at £67 12s. 6d. for spot and £66 7s. 6d. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 16½@16¾c., carload lots at mill.

A shipment of 1015 metric tons of copper from the Union Miniere de Haut Katanga was received at Antwerp Nov. 1. This was followed 10 days later by another lot of 585 tons, the 1600 tons representing the output of the smelting furnaces for 1½ months. The company is arranging to add three units to the two now in operation. The first consignment brought about £70 per ton, being sold in one lot.

Tin—The market developed a sagging tendency. Prices on the London Metal Exchange declined easily, and were lowered correspondingly by the New York dealers. There was no interest shown by consumers, who complained of a severe contraction of business, and the falling off in consumption consequent thereto augurs for an impairment in the statistics and lower prices for the metal. On Nov. 25, some speculation developed in the domestic market, with the result that the orders placed in London brought about a slight advance over there. It closes firm at £181 for spot and £181 15s. for three months, and about 39⅝c. for December tin here.

Lead—The market has been weak, the metal being pressed for sale from several quarters. Still, business has been dull, and the market closes at 4.07½@4.10c., St. Louis, and 4.22@4.25c., New York. At 4.10c. St. Louis, there were sellers over. On Nov. 26 the American Smelting & Refining Co. reduced its price to 4.25c., which was immediately shaded by outsiders.

The London market is also lower, Spanish lead being quoted £18 10s., and English lead 2s. 6d. higher.

Spelter—This market has been narrow and dull. Some sellers report a little improvement in business; others the opposite. Up to Nov. 25 some sales of 50- to 100-ton lots were made at 5.07½c. On Nov. 25 sales were made at 5.10c., and on the same day at 5.05c. All through the week round tonnages have been offered at 5.05c. There is considerable difference of opinion as to the spelter market. Some consider it to be scraping bottom, while others look for it to go lower. There is an accumulation of unsold stock and at times some pressure to sell, while the demand continues light. At the close we quote the market at 5.05@5.10c., St. Louis, and 5.20@5.25c., New York.

The London market for good ordinaries is quoted £20 15s., and specials £21 12s. 6d. per ton.

Base price of sheet zinc in carload lots is $7.50 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Other Metals

Selenium—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 per lb. is paid for retail orders.

Exports from Baltimore for the week included 661 lb. selenium to Liverpool.

DAILY PRICES OF METALS

NEW YORK

Nov.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
20	4.8540	58⅝	*15½ @16	14.80 @14.90	39¾	4.25 @4.30	4.10 @4.15	5.17½ @5.22½	5.02½ @5.07½
21	4.8530	58¼	*15½ @16	14.60 @14.80	39⅞	4.25 @4.27½	4.10 @4.12½	5.17½ @5.22½	5.02½ @5.07½
22	4.8550	57⅞	*15½ @16	14.50 @14.70	39¾	4.25 @4.27½	4.10 @4.12½	5.17½ @5.22½	5.02½ @5.07½
24	4.8535	58⅛	*15 @15½	14⅝ @14⅝	39⅜	4.22½ @4.27½	4.10 @4.12½	5.17½ @5.22½	5.02½ @5.07½
25	4.8545	58½	*15 @15½	14⅝ @14⅝	39⅜	4.22½ @4.27½	4.10 @4.12½	5.20 @5.25	5.05 @5.10
26	4.8535	58⅜	*15 @15½	14⅝ @14⅝	39⅝	4.22½ @4.25	4.07½ @4.10	5.20 @5.25	5.05 @5.10

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Nov.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
20	27	67½	14.67	66¼	73¾	180¼	181¼	19½	4.16	20⅝	4.45
21	26 13/16	66¼	14.39	65¼	71½	180¼	180¾	18⅝	4.10	20⅝	4.45
22	26¾	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	26⅞	65	14.12	64⅛	70½	179	179¾	18⅝	4.10	20½	4.43
25	27 1/16	66¼	14.42	65⅜	71½	179	180	18⅝	4.07	20½	4.43
26	27	67⅛	14.69	66¾	72½	181	181¾	18½	4.02	20⅝	4.48

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latte being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Aluminum—The market is still dull, with light demand and moderate sales. Quotations are uncertain and rather weaker. We give 19@19½c. per lb. for No. 1 ingots, New York. The foreign market is reported quiet.

Antimony—The market has been quiet, with not much more than a retail business doing. Quotations are rather weak. Cookson's is 7.50@7.65c. per lb.; Hallett's 7.25@7.40c.; while 6.25@6.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Demand continues fair and prices are firmer. New York quotation is $39@40 per flask of 75 lb. San Francisco, $39 for domestic orders and special terms for export. London price has been advanced 5s. and is now £7 10s. per flask, with the same price quoted from second hands.

Imports and Exports in Great Britain of metals other than iron and steel are reported as follows for the nine months ended Sept. 30, in long tons, except quicksilver, which is in pounds:

	Imports		Exports	
Metals	1912	1913	1912	1913
Copper	96,039	101,881	41,412	53,512
Tin	30,472	34,345	35208	33,211
Lead	153,470	152,222	42,617	46,267
Zinc	113,067	117,155	7,513	7,623
Quicksilver, lb.	3,371,685	3,213,293	1,835,238	1,627,231
Minor Metals	5,634	6,913	19,855	20,748
Ores, etc.:				
Tin Ore and Concentrates	21,778	25,871	.....	.....
Pyrites	652,634	601,263	.....	.....

Copper includes metal contents of ores, matte, etc. Exports include reëxports of foreign material.

Gold, Silver and Platinum

Gold—Price of gold on the open market in London remained at the Bank level 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. Some gold is still going to Egypt. In New York about $4,000,000 gold has been taken for Canada in the past 10 days.

Iridium—The market is unchanged, sales being made at $80@81 per oz. New York. Supplies are a little larger than they were.

Platinum—The market continues quiet. Contracts for large lots can be placed at $43 per oz., while smaller orders bring up to $44. We quote $43@44 per oz. for refined platinum and $47@50 for hard metal. The demand for the electrical trade has been smaller recently, and the purchasing for the jewelry trade this fall has been light. No. 1 scrap brings $41@42 per oz., according to its condition.

Our Russian correspondent writes, under date of Nov. 10 that demand is quite up to the offering, though no large sales are reported. Offerings of new metal by the starateli have been large for the season, but have been promptly taken up. The conditions point to a strong market and probably some advance in prices. Quotations at Ekaterinburg are 9.50 rubles per zolotnik—$35.72 per oz.—for crude metal, 83% platinum; at St. Petersburg 36,500 rubles per pood—$35.77 per oz.—for the same grade.

Silver—The market shows but little signs of reaction from the decline; this is owing in part to the disturbed conditions in India owing to the embarassment of the India operators and bank troubles, together with the additional fact of unfavorable crop reports from the United Provinces of that country.

Shipments of silver from London to the East, Jan. 1 to Nov. 13, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£9,434,500	£9,094,000	D. £340,500
China	1,377,000	752,000	D. 625,000
Total	£10,811,500	£9,846,000	D. £965,500

Imports of silver at New York for the week were $596,483, from Mexico and South America; exports were $817,567, nearly all to London.

Gold and Silver Movement in the United States 10 months ended Oct. 31:

	Gold		Silver	
	1912	1913	1912	1913
Exports	$44,058,544	$74,563,059	$58,519,766	$53,896,586
Imports	50,677,285	51,590,693	40,985,536	29,968,758
Excess	I. $6,618,741	E. $22,972,366	E. $17,534,230	E. $23,927,828

Exports of merchandise for the 10 months this year were valued at $2,005,010,884; imports, $1,460,188,031; excess of exports, $544,822,053. Adding excess of exports of gold and silver gives $591,722,247 in the total export balance.

Zinc and Lead Ore Markets

JOPLIN, MO.—Nov. 22

Best grades of zinc blende were purchased a half dollar less. The highest price is $45.50, the base per ton of 60% zinc ranging from $40@42.50. Ores of excess iron were purchased up to 10% of iron with no penalty on a base of $42@42.50. The usual penalty is $1 per ton in excess of 1% of iron. Calamine is on a firm base of $21@23 per ton of 40% zinc. The average of all grades of zinc is $41.44 per ton. There is no change in the lead situation, each buyer being as active as possible without advancing prices which are $54.50 high on a base of $52 per ton of 80% metal contents.

SHIPMENTS WEEK ENDED NOV. 22

	Blende	Calamine	Lead	Value
Totals this week	11,200,640	818,330	2,185,740	$302,960
Totals 47 weeks	515,586,050	38,987,440	86,039,740	$14,035,089

Blende value, the week, $238,185; 47 weeks, $12,150,891.
Calamine value, the week, $10,865; 47 weeks, $502,029.
Lead value, the week, $53,910; 47 weeks, $2,282,179.

PLATTEVILLE, WIS.—Nov. 22

The base price paid this week for 60% zinc ore was $40@42 per ton. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED NOV. 22

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,036,620	63,960	1,116,280
Year to date	132,888,990	4,997,080	184,550,840

Shipment of carbonate ore has been resumed from the mines at Highland. Shipped during week to separating plants, 2,628,110 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Nov. 26

The iron and steel markets are quiet and show little change from last week's report.

The volume of new business coming forward is not increasing. Buyers are holding back and do not seem inclined to contract for any long time ahead. Railroad purchases are light and limited to necessary material. Structural steel is quiet, and few new contracts are being placed outside of the municipal work going on in New York and other cities.

Prices have not materially changed, but gradually seeking a lower level. It is not believed, however, that they will go much lower, though there is a good deal of competition for such orders as come out. Mills are gradually curtailing operations, but are still running at a pretty fair gait in most cases.

Pig iron is dull and buying is on a small scale and chiefly for early delivery. Foundry iron is in moderate demand, and the same can be said of basic pig.

PITTSBURGH—Nov. 25

Orders for finished-steel products have decreased further, though not greatly, and probably average 40 to 45% of capacity, while there remains some old business being filled, enabling finishing mills to operate at between 55 and 60% of capacity. Many of the smaller mills are operating at only 40 to 50% of capacity. The Carnegie mills in this district are operating at 75% or more of capacity, but some detached mills, the Columbus plant, for instance, have been closed entirely. It seems certain that next month the mills will drop to operating at about 50% of capacity. After that an improvement in tonnage is expected, for the present orders are believed to be below the actual rate of consumption. Prices will probably not harden on an improvement in tonnage until the mills are brought up to operating at 85 to 90% of capacity. This was the experience in the latter half of 1911. Wage reductions are being discussed and various reductions have been made at minor plants, but at the large steel works no reductions have been made and it is not admitted that any are in contemplation.

Pig Iron—Consumers take a pessimistic view, and are withholding orders to the last moment, and then buying only in the most limited way. Both bessemer and basic are quotable lower and the new quotations could probably be shaded on an attractive order. We quote: Bessemer, $15; basic, $13; No. 2 foundry, $13.50; forge, $13.25, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market is extremely quiet, only carloads being sold and those not frequently. Prices are well maintained, at $50 for English and $49.50 for German, f.o.b. Baltimore.

Steel—The market for billets and sheet bars has not declined since the adjustments on November tonnages, and it is possible December tonnages will be adjusted on the same basis: Billets, $20.50; sheet bars, $21.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are nominal at $26, Pittsburgh.

British Exports and Imports of Iron and Steel and manufactures thereof are valued by the Board of Trade returns for the nine months ended Sept. 30 as follows:

	Exports	Imports	Excess
Iron and steel	£40,962,292	£11,192,013	Exp. £29,770,279
Machinery, hardware, etc	46,328,507	11,907,521	Exp. 34,420,986
Total	£87,290,799	£23,099,534	Exp. £64,191,265
Total, 1912	82,153,805	20,186,118	Exp. 61,967,687

Quantities of iron and steel exported were 3,537,835 long tons in 1912 and 3,723,606 in 1913. Quantities imported were 1,432,757 tons in 1912, and 1,611,493 this year. Value of new ships built for foreign counties is included in the exports.

Pig-Iron Make in Germany in October is reported by the German Iron and Steel Union at 1,650,205 metric tons, being 61,008 tons more than September. For the 10 months ended Oct. 31 the total production was:

	1912	1913	Changes
Foundry iron	2,744,507	3,039,091	I. 294,584
Forge iron	445,953	416,304	D. 28,649
Steel pig	1,794,518	2,156,771	I. 362,253
Bessemer pig	318,463	301,746	D. 16,717
Thomas (basic) pig	9,445,900	10,179,698	I. 733,798
Total	14,749,341	16,093,610	I.1,344,269

The total increase this year is 9.1%. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

IRON ORE

The great storm on the Lakes which wrecked a number of vessels and damaged many others, has demoralized the ore trade from the Lake Superior region. The shipments this week have been light, and another week will probably see the business almost closed for the season.

Imports of Iron Ore in Great Britain for the 10 months ended Oct. 31 were 5,428,260 long tons in 1912, and 6,371,980 in 1913; increase, 943,720 tons. Imports of manganese ore were 316,208 tons in 1913, and 484,253 in 1913; increase, 168,045 tons.

COKE

Connellsville Coke—Contrary to expectations, negotiations are now in progress in several instances for furnace coke on contract for 1914, and it is possible two or three deals may be closed within the next week. The usual asking price is $2, but $1.90 has already been quoted on some brands. Dealers have picked up prompt coke at $1.75, selling to consumers at $1.85, but only in very small lots. Production seems now to be closely regulated to consumption.

Fuel Exports and Imports in Germany, nine months ended Sept. 30, metric tons:

	Exports	Imports	Excess
Coal	25,629,048	7,954,578 Exp.	17,674,470
Brown coal	44,873	5,328,967 Imp.	5,284,094
Coke	4,991,420	430,991 Exp.	4,560,429
Briquettes	2,358,967	106,923 Exp.	2,252,044
Total	33,024,308	13,821,459 Exp.	29,202,846

The exports this year included 16,949 tons of coke shipped to the United States.

Coal Production of German Empire nine months ended Sept. 30, metric tons:

	1912	1913	Changes
Coal	124,094,741	130,083,565	I. 5,988,824
Brown coal	48,925,069	51,736,564	I. 2,811,499
Coke	21,071,920	24,096,566	I. 3,024,645
Briquettes	17,918,209	20,400,080	I. 2,481,871

Of the briquettes reported this year 13,216,964 tons were made from brown coal or lignite.

CHEMICALS

NEW YORK—Nov. 26

The general market is still quiet and business in most lines is on a moderate scale.

Arsenic—There is no activity as yet, though the season for better trade is approaching. Prices are nominally unchanged, $3 per 100 lb. being asked.

Copper Sulphate—A moderate business is reported. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is still dull, though some signs of recovery are looked for. Prices continue 2.25c. per lb. for spot, 2.30c. for December and 2.35c. for January-May delivery.

PETROLEUM

The Ohio Oil Co. on Nov. 21 advanced its buying prices 5c., making quotations for North Lima oil $1.49; South Lima and Indiana, $1.44; Princeton and Illinois, $1.45 per lb. These are the highest prices ever paid for these grades of oil.

OTHER ORE MARKETS

Manganese Ores—The schedule of prices adopted by the Carnegie Steel Co. is as follows, for deliveries in the Pittsburgh district or at South Chicago: Ore containing 49% or over metallic manganese, 25c. per unit; 46 to 49%, 24c.; 43 to 46%, 23c.; 40 to 43%, 22c. These prices are based on ores containing not more than 8% silica or 0.20% phosphorus. Deductions will be made of 15c. per ton for each 1% of silica in excess of 8%; of 2c. per unit of manganese for each 0.02% of phosphorus in excess of 0.20%. Ores containing less than 40% manganese, more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at buyer's option.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	July	August	September	October	November
Alaska shipments	2,705,136	1,847,785	2,261,216	1,951,883	.....
Anaconda	22,100,000	22,500,000	22,600,000	18,400,000	.....
Arizona, Ltd	2,600,000	1,800,000	1,800,000	3,550,000	.....
Copper Queen	8,369,607	8,252,404	8,434,803	8,292,929	.....
Calumet & Ariz	3,800,000	4,500,000	4,000,000	4,500,000	.....
Chino	4,746,525	5,788,572	4,196,296	4,767,466	.....
Detroit	1,549,224	2,187,223	2,102,818	1,861,878	.....
East Butte	1,060,257	1,162,007	1,233,018	1,040,997	.....
Giroux	584,546	524,953	198,178	156,084	.....
Mason Valley	908,892	867,060	918,000	1,052,000	.....
Mammoth	1,800,000	1,750,000	1,750,000	1,700,000	.....
Nevada Con	5,403,919	5,989,973	4,441,671	5,898,046	.....
Ohio	601,700	689,000	685,900	.....	.....
Old Dominion	2,526,000	2,524,000	2,679,000	2,037,000	.....
Ray	4,097,000	4,269,519	4,336,434	4,725,419	.....
Shannon	880,000	1,248,000	1,232,000	1,216,000	.....
South Utah	140,000	223,498	241,843	.....	.....
Tennessee	1,247,804	1,101,019	1,309,985	1,392,162	.....
United Verde*	3,000,000	3,000,000	3,000,000	3,000,000	.....
Utah Copper Co.	9,849,043	10,302,251	11,463,905	9,929,478	.....
Lake Superior*	17,500,000	9,700,000	6,950,008	5,500,000	.....
Non-rep. mines*	6,200,000	6,200,000	6,000,000	6,200,000	.....
Total prod	101,669,653	96,427,264	91,835,075	.....	.....
Imp., bars, etc	29,029,990	22,474,471	35,703,660	.....	.....
Total blister	130,699,643	118,901,735	127,538,735	.....	.....
Imp. ore & matte	8,527,046	9,171,351	10,800,162	.....	.....
Total Amer	139,226,689	128,073,086	138,338,897	.....	.....
Miami†	2,890,000	3,097,500	2,688,000	2,862,050	.....
Shattuck-Arizona	1,019,388	1,001,634	1,163,237	993,224	.....
Brit. Col. Cos.:					
British Col. Cop.	618,379	647,905	621,120	.....	.....
Granby	1,664,102	1,847,344	1,824,659	1,718,258	.....
Mexican Cos.:					
Boleo†	2,240,720	2,264,640	2,369,920	2,424,800	.....
Cananea	3,328,000	3,186,000	3,148,000	3,682,000	.....
Moctezuma	2,693,006	3,542,047	3,024,121	3,178,136	.....
Other Foreign:					
Braden, Chile	1,046,000	1,572,000	1,332,000	2,006,000	.....
Cape Cop., S. Af.	.....	.....	607,040	712,320	.....
Kyshtim, Russia	2,500,000	1,585,000	1,187,000	.....	.....
Spassky, Russia	660,800	1,048,320	1,025,920	.....	.....
Exports from					
Chile	9,856,000	8,736,000	5,600,000	6,160,000	.....
Australia	10,304,000	7,720,000	6,944,000	7,728,000	.....
Arrivals-Europe‡	11,728,640	14,624,960	9,661,120	18,040,960	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.
‡ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

	United States			Visible Stocks.		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
XI, '12	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	139,070,481	68,173,720	68,123,473	29,793,094	53,625,600	83,418,692
XI	.....	.....	.....	32,566,382	48,787,200	81,353,582
XII	.....	.....	.....	.....	.....	.....

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Atlantic, Ida.	Nov. 3	Dec. 2	0.0005
Beaver Copper, Utah	Nov. 12	Dec. 2	0.005
Belcher, Nev.	Nov. 12	Dec. 4	0.10
Cardiff, Utah	Nov. 20	Dec. 10	0.01
Clear Grit, Ida.	Nov. 10	Dec. 10	0.0025
Coeur d'Alene Invest., Ida.	Nov. 7	Dec. 8	0.003
Colusa, Ida.	Nov. 10	Dec. 2	0.005
Copper Chief, Ida.	Nov. 10	Dec. 6	0.0025
Deer Trail, Utah	Nov. 3	Dec. 3	0.0075
Eagle Mountain, Ida.	Nov. 18	Dec. 6	0.0005
East Hercules, Ida.	Nov. 15	Dec. 15	0.0015
Emerald, Utah.	Nov. 15	Dec. 13	0.005
Empire, Ida.	Oct. 20	Dec. 1	0.005
Federal Ely, Nev.	Nov. 10	Dec. 10	0.005
Giant, Ida.	Nov. 1	Dec. 4	0.003
Hider-Nevada, Nev.	Nov. 17	Dec. 6	0.02
Hornet, Utah.	Nov. 14	Dec. 1	0.01
Laclede, Ida.	Nov. 24	Dec. 15	0.003
Little North Fork, Ida.	Oct. 8	Dec. 1	0.001
Nabob, Ida.	Nov. 17	Dec. 15	0.005
Ruby Hill, Utah.	Nov. 1	Dec. 6	0.005
Silver Cliff, Ida.	Nov. 20	Dec. 10	0.005
Snowstorm, Ida.	Nov. 13	Dec. 12	0.002
Utah Fertilizer, Utah.	Nov. 8	Dec. 9	0.15
Utah First National, Utah.	Nov. 17	Dec. 3	0.001
Wisconsin, Ida.	Nov. 10	Dec. 10	0.002
Wonder of Pine Creek, Ida.	Nov. 3	Dec. 3	0.001

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	60.640	24.209	29.088	27.986
October	53.340	63.471	60.793	24.594	29.299	28.083
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	16.328	17.698	16.799	78.762	73.125
October	17.314	16.337	17.661	16.913	76.389	73.383
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.140
March	42.577	46.832	192.619	213.615
April	43.923	49.115	200.513	224.159
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	42.410	223.762	193.074
October	50.077	40.462	228.353	184.837
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	4.698	4.924	4.579	22.292	20.648
October	5.071	4.402	4.894	4.253	20.630	20.302
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	5.694	7.313	5.544	27.048	21.148
October	7.426	5.340	7.276	5.188	27.543	20.614
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	16.65	16.03	15.04	15.63	14.93
October	17.90	16.60	17.18	14.61	17.22	14.80
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Nov. 24

Name of Comp.	Bid.
Acacia	.02¾
Cripple Cr'k Con.	.01
C. K. & N.	.08
Doctor Jack Pot	.05
Elkton Con.	.51
El Paso	2.75
Findlay	.02
Gold Dollar	.06½
Gold Sovereign	.02¾
Golden Cycle	2.00
Isabella	.08
Jack Pot	.04½
Jennie Sample	.04
Jerry Johnson	.03½
Lexington	$.03
Old Gold	.01
Mary McKinney	.56
Pharmacist	.01
Portland	.98
Vindicator	.82

SALT LAKE Nov. 24

Name of Comp.	Bid.
Beck Tunnel	.03½
Black Jack	.03½
Cedar Talisman	$.00½
Colorado Mining	.10
Columbus Con.	$.01
Crown Point	.00½
Daly-Judge	5.10
Grand Central	.50
Iron Blossom	1.12½
Little Bell	.15
Lower Mammoth	.01
Mason Valley	1.50
May Day	.04½
Nevada Hills	.35
New York	$.02½
Prince Con.	.24
Silver King Coal'n.	3.50
Sioux Con.	.01
Uncle Sam	.03
Yankee	$.06

TORONTO Nov. 24

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.05¾	Foley O'Brien	.16
Coniagas	7.15	Hollinger	17.50
T. & Hudson Bay	65.00	Imperial	$.02
Timiskaming	.14	Jupiter	.08
Wettlaufer-Lor.	.07	Pearl Lake	.09
Apex	$.01	Porcu. Gold	.10
Big Dome	12.50	Preston E. D.	.03
Crown Chartered	$.00¾	Rea	.10
Doble	$.10	Swastika	.02
Dome Exten.	.07½	West Dome	.05

SAN FRANCISCO Nov. 18

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.06	Belmont	7.50
Belcher	.30	Jim Butler	.73
Best & Belcher	.04	MacNamara	.09
Caledonia	1.75	Midway	.38
Challenge Con.	.11	Mont.-Tonopah	.90
Chollar	.04	North Star	.45
Confidence	.35	West End Con.	1.27½
Con. Virginia	.12	Atlanta	.10
Crown Point	.26	Booth	.02
Gould & Curry	.03	C.O.D. Con.	.03
Hale & Norcross	.07	Comb. Frac.	.04
Mexican	1.30½	Jumbo Extension	.08
Occidental	.70	Pitts.-Silver Peak	.38
Ophir	.21	Round Mountain	.36
Overman	.30	Sandstorm Kendall	.07
Potosi	.03	Silver Pick	.03
Savage	.11	Argonaut	3.00
Sierra Nevada	.07	Bunker Hill	2.00
Union Con.	.12	Central Eureka	.20
Yellow Jacket	.30	So. Eureka	‡2.00

N. Y. EXCH. Nov. 24

Name of Comp.	Clg.
Amalgamated	68¾
Am. Agri. Chem.	43
Am.Sm.&Ref.,com.	62¾
Am. Sm. & Ref., pf.	98½
Am. Sm. Sec., pf. B	81
Anaconda	33¾
Batopilas Min.	.75
Bethlehem Steel,pf.	68½
Chino	37½
Federal M. & S., pf.	32
GreatNor.,ore.,ctf.	32
Guggen. Exp.	43¾
Homestake	112
Inspiration Con.	14
Miami Copper	21
Nat'l Lead, com.	43
National Lead, pf.	103
Nev. Consol.	15
Phelps Dodge	188
Pittsburg Coal, pf.	87
Quicksilver, pf.	3
Ray Con.	17½
Republic I&S,com.	19½
Republic I&S, pf.	79
SlossSheff'd,com.	26
Sloss Sheffield, pf.	86
Tennessee Copper	28
Utah Copper	47½
U. S. Steel, com.	55
U. S. Steel, pf.	104½
Va.Car.Chem.,pf.	92

N. Y. CURB Nov. 24

Name of Comp.	Clg.
Ariz. Belmont	.04½
Barnes King	‡1½
Beaver Con.	.34
Big Four	.10
Braden Copper	6½
B. C. Copper	2½
Buffalo Mines	1½
Can. G. & S.	.11
Caribou	.60
Con. Ariz. Sm.	.25
Coppermines Cons.	1½
Davis-Daly	1½
Diam'field-Daisy	‡.03
Ely Con.	.02½
Florence	.22
Gold Hill Con.	.25
Goldfield Con.	1½
Greene Cananea	31½
Greenwater	.06
Internat. S. & R.	‡115
Kerr Lake	4½
La Rose	1½
McKinley-Dar-Sa.	1½
Min. Co. of A. new	2 1/16
New Utah Bingham	.45
Nipissing Mines	7½
Ohio Copper	1/16
Pacific Sm. & M.	‡½
Puebla S. & R.	2½
South Utah M&S.	‡3/16
Stand'd Oil of N.J.	377
Stewart	1½
Tonopah	5½
Tonopah Ex.	1½
Tonopah Merger	.57
Tri-Bullion	½
Tularosa	3/16
Union Mines	‡.08
United Cop., pfd.	‡3
Yukon Gold	2 1/16

LONDON Nov. 15

Name of Comp.	Clg.
Camp Bird	£0 14s 0d
El Oro	0 14 0
Esperanza	0 16 3
Mexico Mines	5 7 6
Oroville	0 7 6
Santa Gert'dis.	0 16 3
Stratton's	0 0 9
Tomboy	1 6 3

BOSTON EXCH Nov. 24

Name of Comp.	Clg.
Adventure	1½
Ahmeek	225
Alaska Gold M.	18½
Algomah	1
Allouez	30½
Am. Zinc	16½
Ariz. Com., ctfs.	4½
Bonanza	.50
Boston & Corbin	.50
Butte & Balak	4
Calumet & Ariz.	60½
Calumet & Hecla	385
Centennial	11
Cliff	‡1
Copper Range	32½
Daly West	2½
East Butte	6½
Franklin	2½
Granby	68
Hancock	13½
Hedley Gold	30
Helvetia	.25
Indiana	3
Island Cr'k, com	46½
Island Cr'k, pfd.	81
Isle Royale	16½
Keweenaw	2½
Lake	4½
La Salle	3½
Mass	2
Michigan	.75
Mohawk	38½
New Arcadian	1½
New Idria Quick	5½
North Butte	22½
North Lake	1
Ojibway	.75
Old Dominion	47
Osceola	67
Quincy	53
Shannon	6
Shattuck-Ariz.	25½
Superior	20½
Superior & Bost.	2½
Tamarack	25
Trinity	3½
Tuolumne	.75
U. S. Smelting	36½
U. S. Smelt'g, pf.	46½
Utah Apex	1½
Utah Con.	7½
Victoria	1 3/16
Winona	1½
Wolverine	39½
Wyandot	.40

BOSTON CURB Nov. 24

Name of Comp.	Bid
Bingham Mines	.5
Boston Ely	.46
Butte&Lon'nDev.	.30
Cactus	.02
Calaveras	1½
Chief Cons.	1 3/16
Corbin	‡1
Cortez	.21
Crown Reserve	1½
Eagle & Blue Bell	.90
First Nat. Cop.	2½
Houghton Copper	2½
Majestic	.25
Mexican Metals	.33
Moneta Porc.	‡.07
Nevada-Douglas	1½
New Baltic	.50
Oneco	.80
Raven Copper	.10
Rhode Island Coal	.01
Smokey Dev.	.25
So. Lake	2½
S. W. Miami	‡1½
Tonopah Victor	.30
Trethewey	.30
United Verde Ext.	.40

‡Last Quotation.